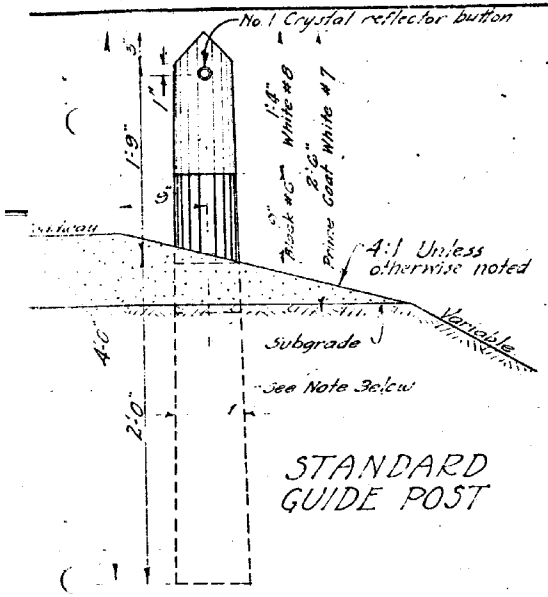
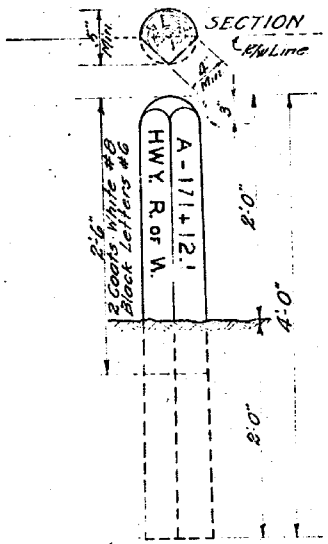
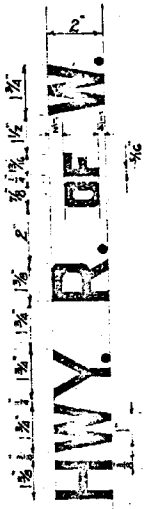


STANDARD GUIDE POST

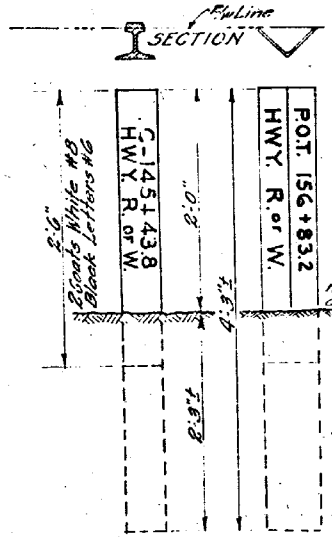


TYPE "A" R/W MARKER

Posts to be native juniper, native cedar or native cypress. Minimum 5" diameter at top. Top to be rounded 3" and 2 sides to be dressed to a minimum 4" face.

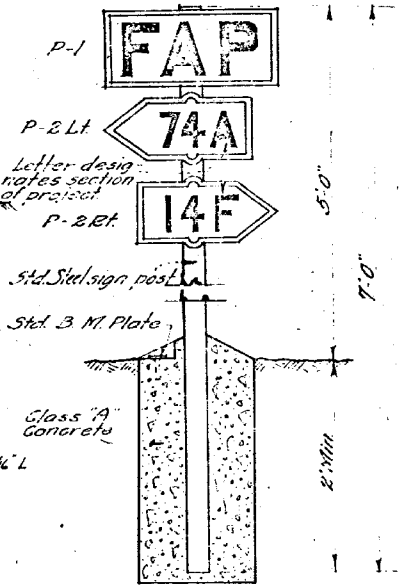


DETAIL OF LETTERS.



TYPE "E" R/W MARKER

50 # Steel Rail or 3"x3"x5/16" L



PROJECT MARKER

To be erected at each end of all Federal Aid Projects by the Resident Engineer.

Project Markers are to be placed on R/W line, but not more than 50' from ℄ of road, if R/W is greater than 100'.

GENERAL REQUIREMENTS

Round posts shall be 6" min. & 9" max. diameter at a point 6" below top of post and 7½" min. & 10½" max. diameter at the butt, and shall be graded for size so that in any one continuous row of guide posts the top diameters shall not vary more than 1". Measurement for size shall be made after shrinkage.

The minimum heartwood in any post shall equal ½ the diameter + ½ inch.

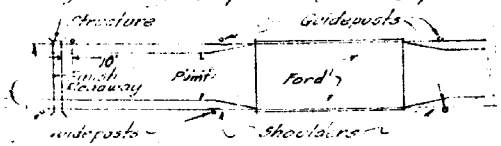
All guide posts shall conform to Std. Specs.

Guide post locations shown on plans are approximate and changes may be necessary to meet field conditions.

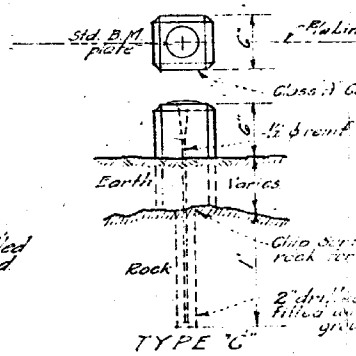
When placed in rows guide posts shall be spaced 50' center to center.

Type of guide posts & road guard posts shall conform throughout project.

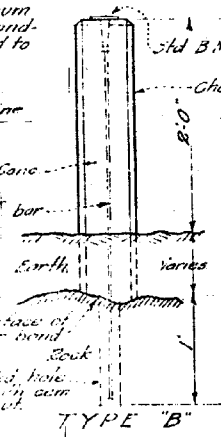
Reflector button as shown above is to be installed facing traffic after post is erected & painted.



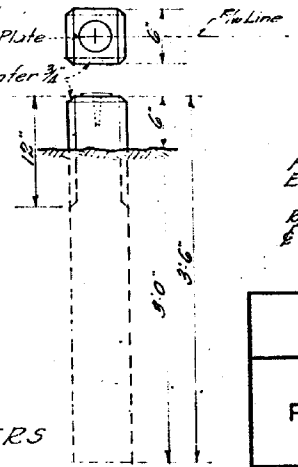
TYPICAL GUIDE POST INSTALLATION



TYPE "C"



TYPE "B"



TYPE "D"

CONCRETE R/W MARKERS

Note:- R/W Markers to be erected where shown on the plans or as determined by the Engineer. Stationing to be furnished by Engineer. When R/W Markers are in solid rock type "B" may be substituted for Type "A" and Type "C" may be substituted for Type D.

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION			REV.
GUIDE POSTS RIGHT OF WAY AND PROJECT MARKERS.			
DRAWN	A.S.	6/11/59	DRAWING NO.
TRACED	K.S.	6/11/59	A-1
CHECKED	H.W.	7/20/59	
APPROVED ENGR. PLANS			

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C-01.11 Plans Symbols
C-01.12 Plans Symbols
C-01.30 General Abbreviations
C-01.31 General Abbreviations
C-01.32 General Abbreviations

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C-03.10 Ditches & Dykes
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C-10.27 Transition W Beam (Timber Post) to Concrete Half Barrier
C-10.28 Transition W Beam (Timber Post) to Concrete Half Barrier
C-10.29 Transition W Beam (Timber Post) to Concrete Half Barrier
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C-10.46 Transition W Beam to Concrete Median Barrier
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C-10.49 W Beam BCT Attenuator Assembly
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C-10.52 W Beam BCT Attenuator Assembly
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C-10.55 W Beam BCT Attenuator Assembly, Curb Installation
C-10.56 W Beam BCT Attenuator Assembly, Curb Installation
C-10.57 W Beam BCT Attenuator Assembly, Curb Installation
C-10.58 W Beam BCT Attenuator Assembly, Curb Installation
C-10.60 Median W Beam BCT Attenuator Assembly
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C-11.30 Cattle Guard, Railroad

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C-12.30 Fence, Gate, Type 1 & 2

C-12.40 Fence, Flood Gate
C-12.50 Fence, Misc. Details
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C-13.30 Pipe & Pipe Arch, Corrugated Metal Concrete Invert Paving
C-13.35 Structural Excavation, Payment Limits
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C-14.10 Headwall, Pipe, Straight & "L" Types
C-14.20 Headwall, Normal to Pipe, 42" - 84" Pipe
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C-14.30 Headwall, Drop Inlet

C-15.10 Catch Basin, Type 1
C-15.20 Catch Basin, Type 3
C-15.30 Catch Basin, Type 4
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C-17.10 Bank Protection, Rail Types 1, 2 & 3
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C-18.20 Manhole Frame & Cover

C-19.10 Ford - Concrete Walls
C-19.20 Ford - Types 1 & 2

C-21.10 Survey Monument, Frame & Cover, Right Of Way Marker
C-21.20 Standard Marker

C-22.10 Utility Line, Protective Concrete Slab

	Pen Size	NEW	Pen Size	EXISTING
City Limits (Zip-a-Tone No.113, Shade inside)			1	
County Line			2	
Forest or Reservation Boundry (Line-Shading, Shade inside)			2	
Property Line	1	P/L P/L	00	P/L P/L
Quarter Section Line			1	
Right-Of-Way Line	1	New R/W	00	Existing R/W
Section Line			1	
Sixteenth Section Line			1	
State or National Boundry			4	
Township or Range Line			2	
Mile Post	1	MP	00	MP
Right-Of-Way Marker	1		00	
Survey Monument	1		00	
Angle Point	1		00	
Construction ℄, Station Marks	3-0		0-0	
Quarter Corners			00	
Section Corners			00	
Survey Control Point	1		00	
Access Control (Chart Pak 256 TAA 1/8" wide, Shade outside)	1	New	00	Existing
Curb & Gutter with Depressed Curb (1" = 20')	1	.05" .10"	00	.05" .10"
Curb & Gutter with Depressed Curb (1" = 100')	1	.05" .05"	00	.05" .05"

	Pen Size	NEW	Pen Size	EXISTING
Curb, Single with Depressed Area	1	.05"	00	.05"
Pavement & Sidewalk Edge	1		00	
Turnout (Indicate width & surface material)	1	R	00	R
Cut	0	C C		
Fill	0	F F		
Transition ; Cut to Fill	0	C F		
Railroad Track (1" = 20')			00	
Railroad Track (1" = 100')			00	
Bank Protection	1		00	
Bridge	1		00	
Building	1	Floor Elevation 1984.69	00	Floor Elevation 1984.69
Catch Basin, Curb & Gutter	1		00	
Catch Basin, Median Dike			00	
Catch Basin, Off Roadway, Flush	1		00	
Catch Basin, Single Curb	1		00	
Cattle Guard	1		00	
Concrete Box Culvert	1		00	
Dike	1		00	
Downdrain, one way	0		00	

DESIGN APPROVED	ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION- STANDARD DRAWINGS	REV. DATE
APPROVED FOR DISTRIBUTION	PLANS SYMBOLS	PLAN NO. C-01.10

	Pen Size	NEW	Pen Size	EXISTING
Downdrain, two way	0		00	
Manhole	1		00	
Manhole Frame & Cover, Reset	1			
Retaining Wall	1		00	
Rock Riprap	1		00	
Spillway, one way	0		00	
Spillway, two way	0		00	
Straight Headwall with End Section (1" = 20')	1		00	
Straight Headwall with End Section (1" = 100')	1		00	
"U" Headwall with End Section (1" = 20')	1		00	
"U" Headwall with End Section (1" = 100')	1		00	
Wing Headwall with End Section (1" = 20')	1		00	
Wing Headwall with End Section (1" = 100')	1		00	
Plan, Aggregate Surface (Zip-a-Tone No. 275-20)	1		00	1W AGGREGATE
Bituminous Pavement (Zip-a-Tone No. 309)	1		00	1W BITUMINOUS
Concrete Pavement (Zip-a-Tone No. 340)	1		00	1W CONCRETE
Graded Surface	1		00	1W GRADED
Obliterate Pavement (Zip-a-Tone No. 438)	1			
Section, Asphaltic Concrete Friction Course	1		00	ACFC
Bituminous Pavement	1		00	BITUMINOUS
Concrete Pavement	1		00	CONCRETE

	Pen Size	NEW	Pen Size	EXISTING
Aggregate Base	1		00	AGGREGATE
Select Material	1		00	SELECT
Subgrade Seal	1		00	SUBGRADE
Ground Line Profile			0	
Ground Line Section	0		00	
Barbed Wire Fence & Gate	0		00	
Chain Link Fence & Gate	0		00	
Guard Rail & Breakaway Cable Terminal	1		00	
Gas Line	0	G 3"	00	G 3"
Irrigation Ditch, Concrete	0	IRR	00	IRR
Irrigation Ditch, Earth	0	IRR	00	IRR
Irrigation Line (1" = 20')	0	IRR 24"	00	IRR 24"
Irrigation Line (1" = 100')	0	IRR 24"	00	IRR 24"
Power or Joint Use Line	1		00	
Sanitary Sewer (1" = 20')	0	S 8"	00	S 8"
Sanitary Sewer (1" = 100')	0	S 8"	00	S 8"
Storm Drain (1" = 20')	0		00	SD 24"
Storm Drain (1" = 100')	0	SD 24"	00	SD 24"
Street Light with Mast Arm	1		00	

DESIGN APPROVED	ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION - STANDARD DRAWINGS	REV. DATE
APPROVED FOR DISTRIBUTION	PLANS SYMBOLS	PLAN NO. C-01.11

	Pen Size	NEW	Pen Size	EXISTING
Telephone Booth	1	T	00	T
Telephone Line	1	T T	00	T T T
Utility Pole with Down Guy & Anchor	1		00	
Water or Gas Meter Box	0	W or G	00	W or G
Water or Gas Valve	0	W or G	00	W or G
Water Line	0	W 6"	00	W 6"
Drainage Channel	1		00	
Drainage Ditch	1		00	
Major Wash			00	Name
Minor Wash			00	
Hedge	0		00	
Palm Tree	0		00	
Shrubbery	0		00	
Unclassified Tree	0		00	
Advertising Sign, Large			00	
Advertising Sign, Small			00	
Traffic Sign, Single Post	1		00	
Traffic Sign, Two or More Posts	1		00	
℄ Grade, Profile	2		00	
Dimensions	00			
Visible Outlines, Sections, etc.	1			

	Pen Size	NEW	Pen Size	EXISTING
Ugnd Tel/ Telegraph	1	T T	00	T T
Ugnd Power/Joint Use	1	P P	00	P P

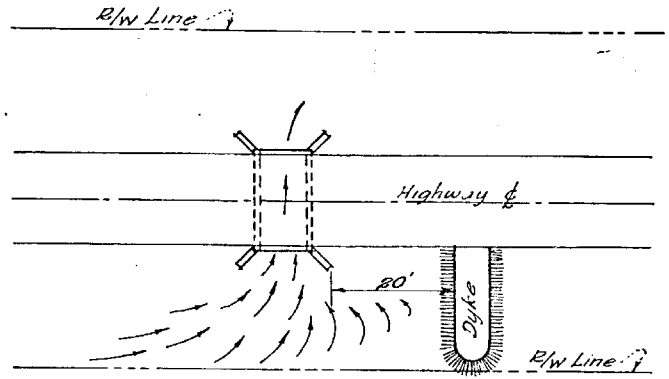
NOTE

ALL LINES AND SYMBOLS NOT SHOWN WILL CONFORM TO;

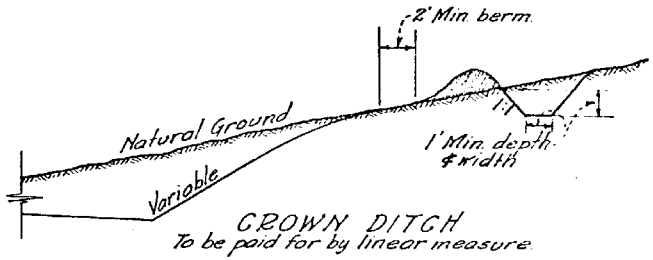
American National Standard Lines for Engineering Drawings (ANSI Y14.2-1973)

American National Standard Symbols for Section Lining (ANSI Y14.2-1973)

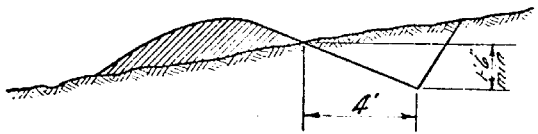
DESIGN APPROVED	ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION - STANDARD DRAWINGS	REV DATE
APPROVED FOR DISTRIBUTION	PLANS SYMBOLS	PLAN NO. C-01.12



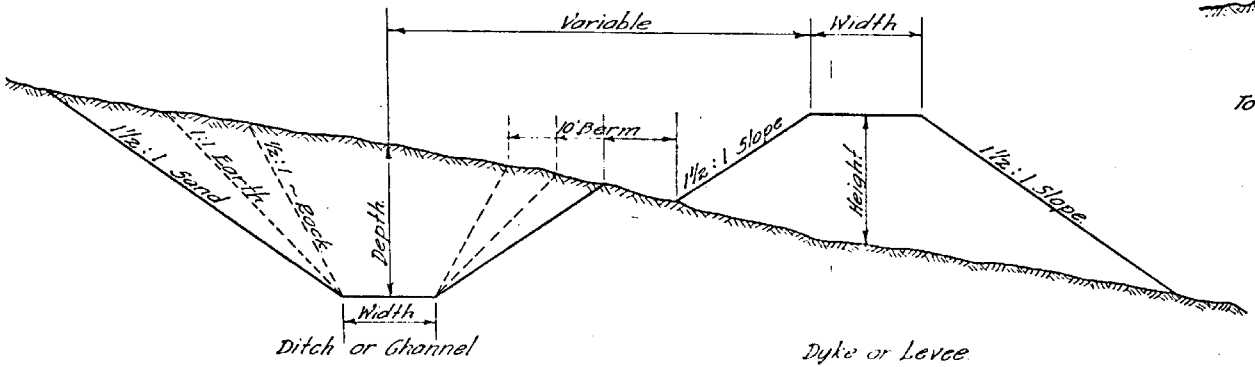
TYPICAL DYKE INSTALLATION AT STRUCTURE.
Dykes at structures to be so placed that they create a water cushion, generally 20' back from end of wings.



CROWN DITCH
To be paid for by linear measure

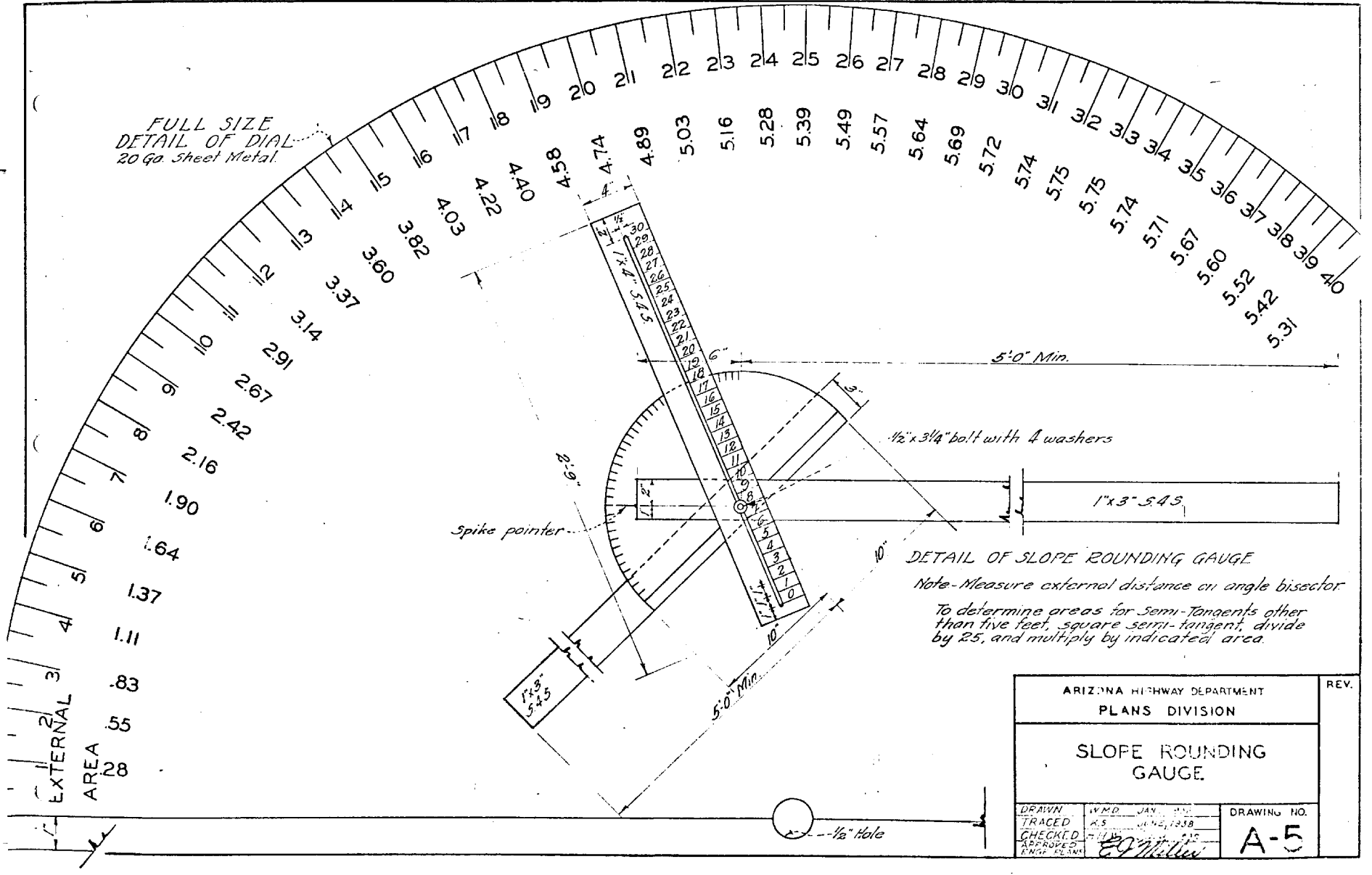


GRADER DITCH
To be used where shown on plans or called for by Engineer
To be paid for by linear measure



SECTION OF DITCH, CHANNEL, DYKE OR LEVEE.
Dimensions shown on plans are respectively width, (depth or height) and length.
Standard slope rounding as shown on Standard Drawing "A-2" shall be used where revegitation, erosion control or beautification in metropolitan areas is necessary

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION			REV
STANDARD DITCHES , DYKES AND CHANNELS.			
DRAWN	W.M.D.	6/1/36	DRAWING NO.
TRACED	N.S.	8/11/38	A-4
CHECKED	H.H.W.	7/20/38	
APPROVED ENGR. PLANS	C. H. Miller		

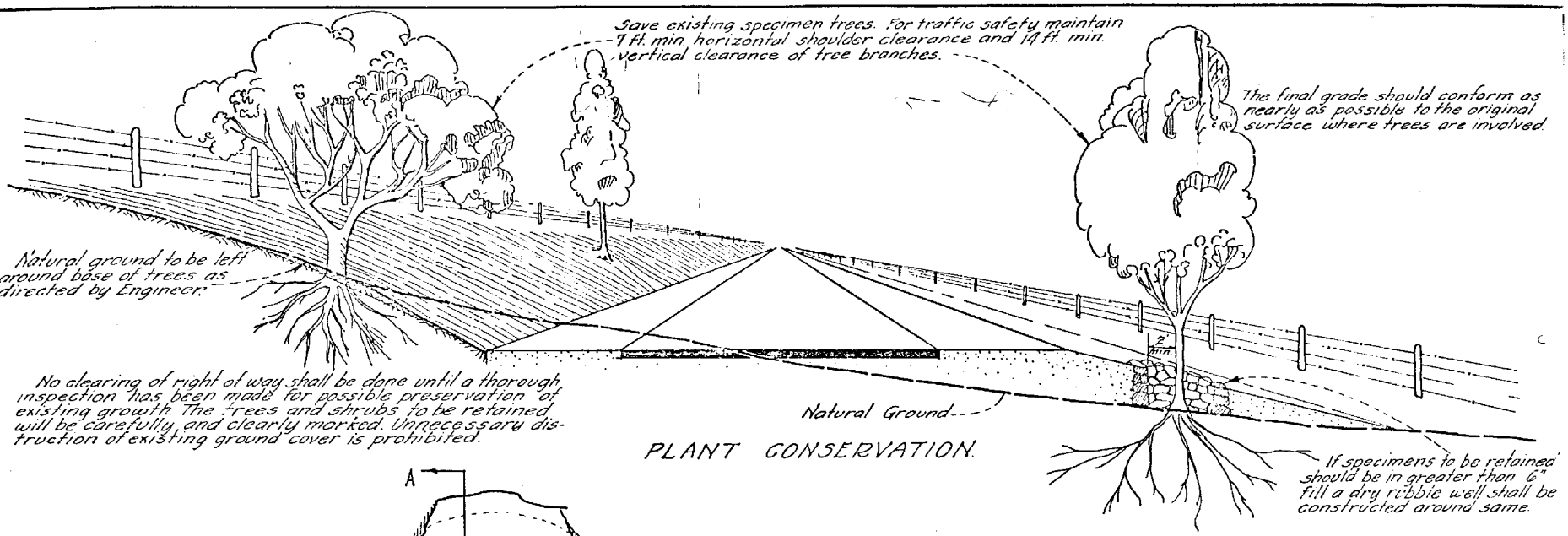


DETAIL OF SLOPE ROUNDING GAUGE

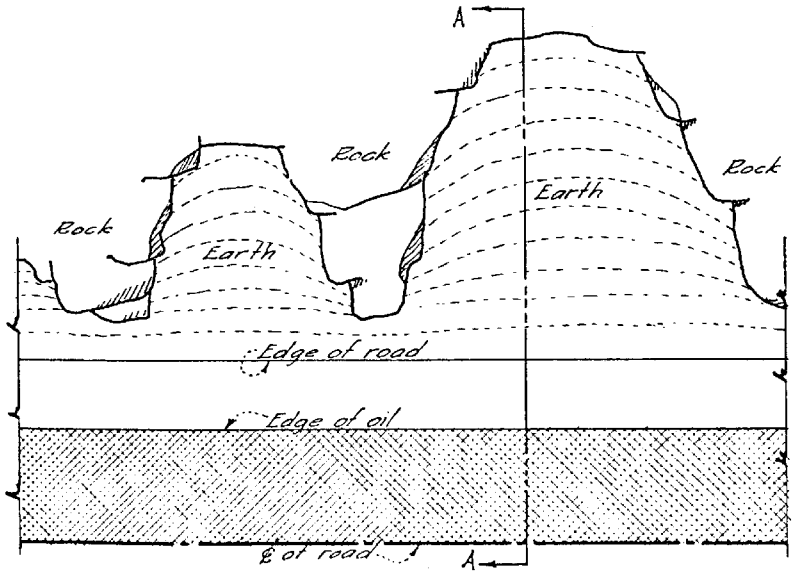
Note-Measure external distance on angle bisector.

To determine areas for Semi-Tangents other than five feet, square semi-tangent, divide by 25, and multiply by indicated area.

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION		REV.
SLOPE ROUNDING GAUGE		
DRAWN W.M.D. JAN. 1938 TRACED K.S. JUNE, 1938 CHECKED APPROVED ENGR. OF PLANS E.J. Miller	DRAWING NO. A-5	



PLANT CONSERVATION.

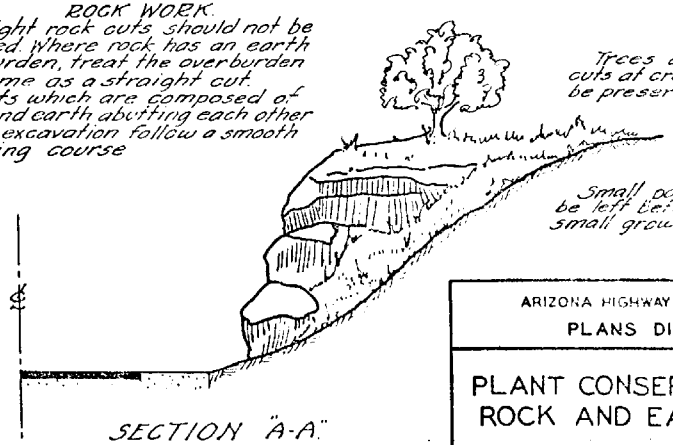


PLAN ~ ROCK & EARTH CUT.

ROCK WORK.

Straight rock cuts should not be rounded. Where rock has an earth overburden, treat the overburden the same as a straight cut.

In cuts which are composed of rock and earth abutting each other let the excavation follow a smooth rounding course



SECTION "A-A"

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

PLANT CONSERVATION & ROCK AND EARTH CUTS

DRAWN	W.M.D.	JAN, 1936	DRAWING NO.
TRACED	K.S.	JUNE, 1938	A-6
CHECKED	[illegible]	[illegible]	
APPROVED ENGR PLANS	E. F. Miller		

General Requirements for Road Guard ~

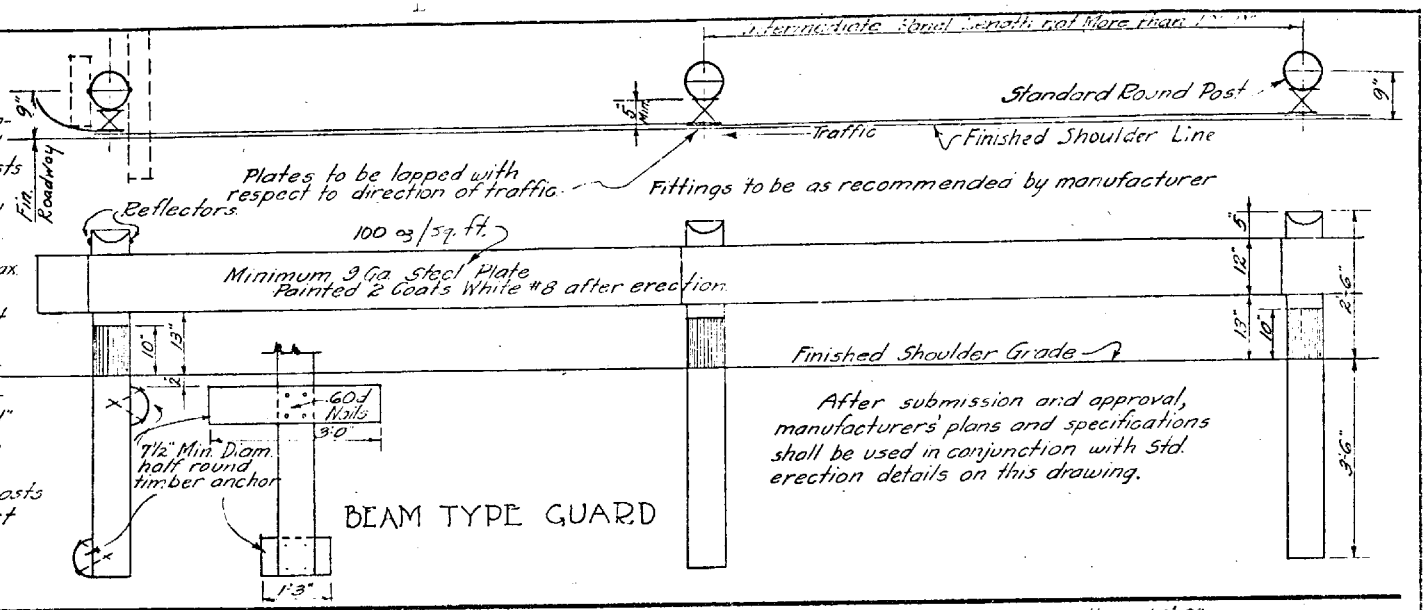
In order to secure proper alignment, all bolt holes shall be bored and top of posts trimmed after posts are set.

Length of bolts shall be governed by size of posts.

Round posts shall be 6" min. and 9" max. diameter at a point 6" below top of post, and 7½" min. and 10½" max. diameter at the butt; and shall be graded for size so that in any one continuous section of road guard the top diameters shall not vary more than 1".

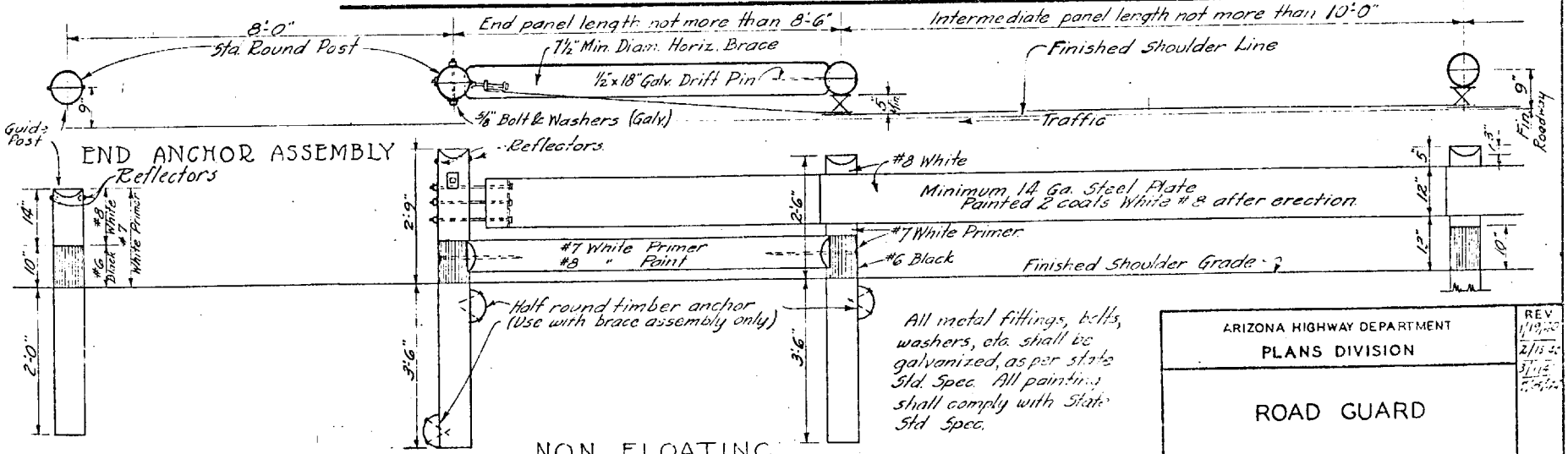
Measurement for size shall be made after shrinkage.

No. 1 Crystal Reflectors in end posts and every third intermediate post facing traffic both ways.



BEAM TYPE GUARD

After submission and approval, manufacturers' plans and specifications shall be used in conjunction with Std. erection details on this drawing.



END ANCHOR ASSEMBLY

NON FLOATING TENSION TYPE GUARD

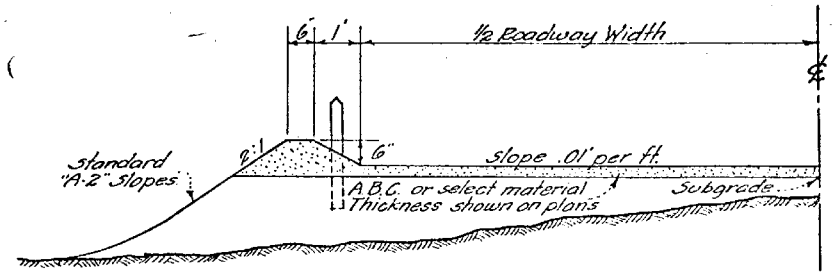
All metal fittings, bolts, washers, etc. shall be galvanized, as per state Std. Spec. All painting shall comply with State Std. Spec.

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

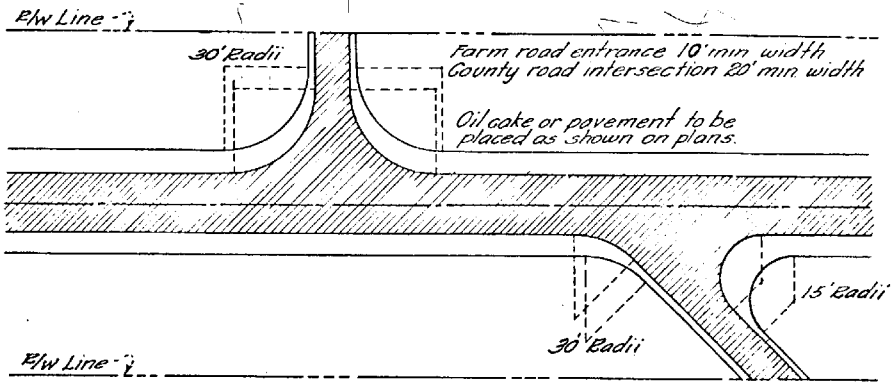
ROAD GUARD

DRAWN	K.S. JUNE, 1939	DRAWING NO.
TRACED	H.A.K. JUNE, 1939	A-7
CHECKED	H.H.W. July, 1938	
APPROVED ENGR. PLANS	E.H. Wilson	

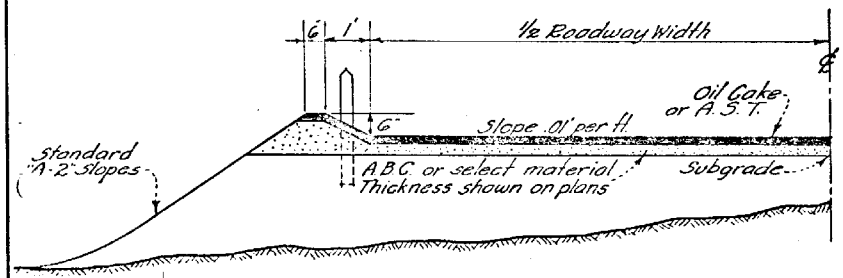
REV. 1/19/50 2/15/50 3/1/50 [illegible]



EMBANKMENT GUTTER FOR GRAVEL ROADWAY.



SIDEROAD ENTRANCES.



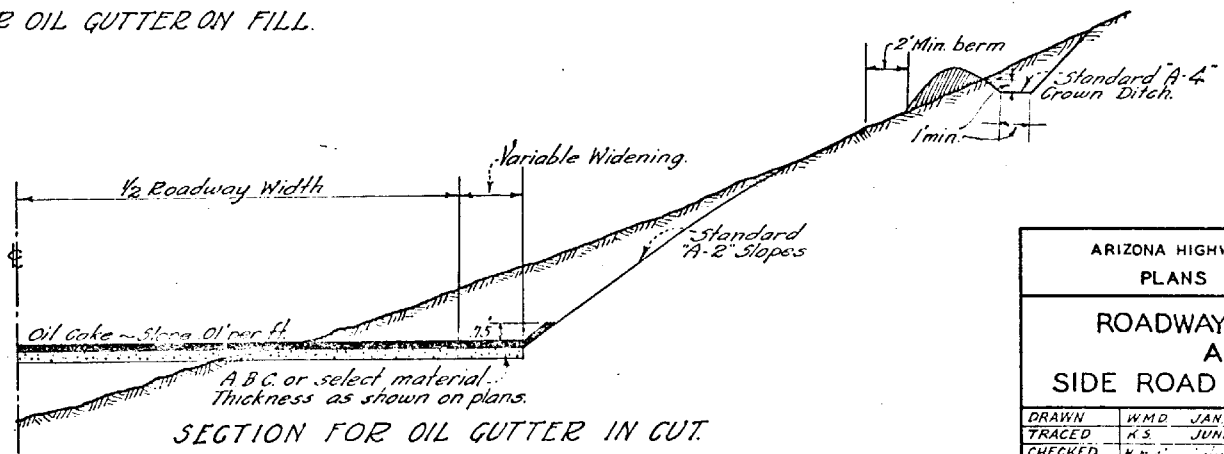
SECTION FOR OIL GUTTER ON FILL.

GENERAL NOTES

Typical sections and slopes shown on this sheet may be superseded by special cross sections and slopes as shown on plans.

OIL FLARES

1. All small structures within one foot of finish grade shall have 3:1 oil flares.
2. All structures over 20' clear span shall have 50' oil flares.
3. Wifords shall have 100' oil flares.



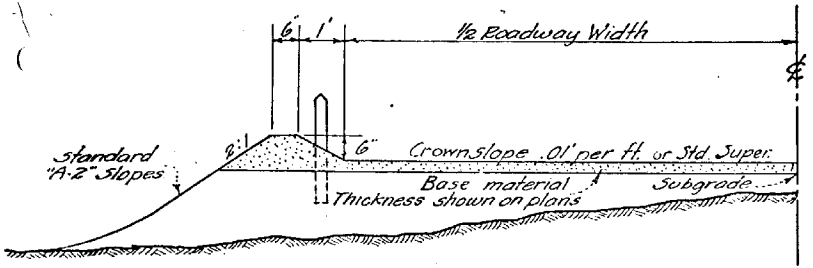
SECTION FOR OIL GUTTER IN CUT.

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

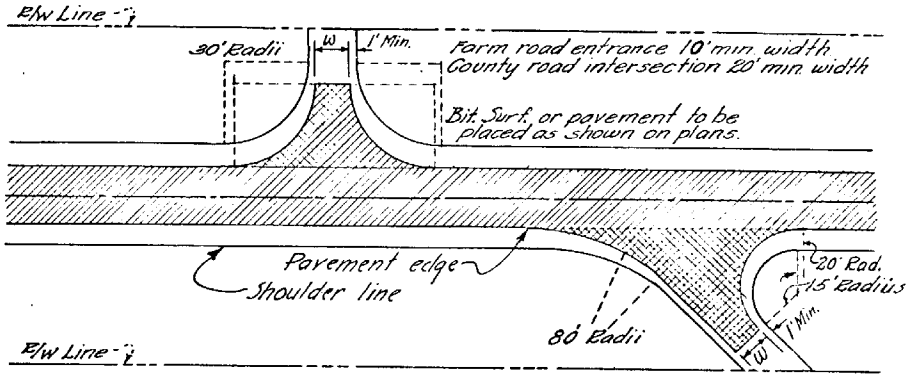
REV.

ROADWAY GUTTERS AND SIDE ROAD ENTRANCES

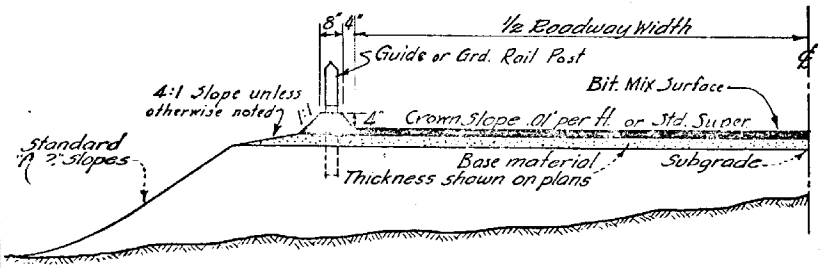
DRAWN	W.M.D.	JAN., 1936	DRAWING NO.
TRACED	K.S.	JUNE, 1938	A-8
CHECKED	H. [illegible]	[illegible] 1938	
APPROVED ENGR. PLANS	E. Miller		



EMBANKMENT CURB FOR GRAVEL ROADWAY.



SIDEROAD ENTRANCES.



SECTION FOR BIT. MIX CURB ON FILL.

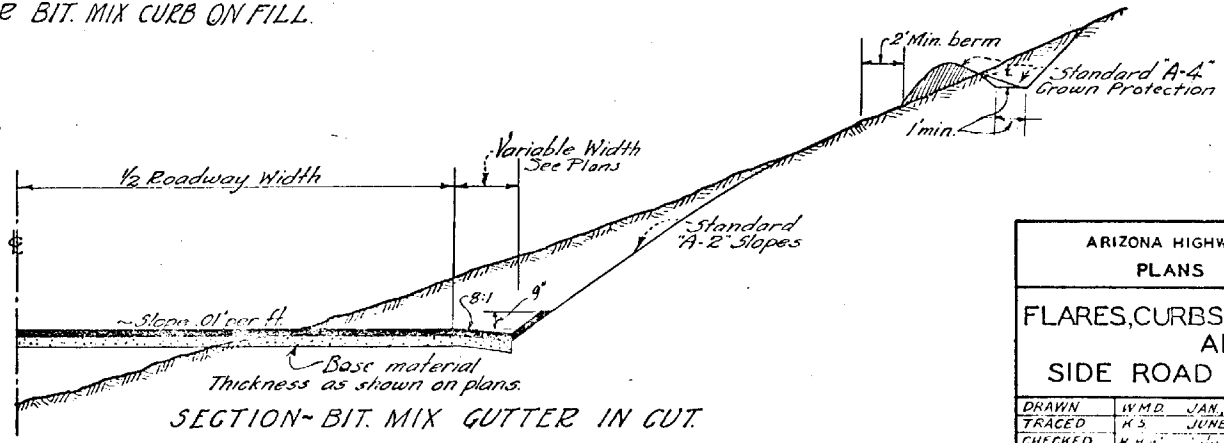
GENERAL NOTES

Typical sections and slopes shown on this sheet may be superseded by special cross sections and slopes as shown on plans.

All structures within 1 ft. of finished grade shall have bituminous surface full width.

BIT. SURF. FLARES

1. All small structures within one foot of finish grade shall have 3:1 Bit. Flares.
2. All structures over 20' clear span shall have 50' Bit. Flares.
3. Alifords shall have 100' Bit. Flares.



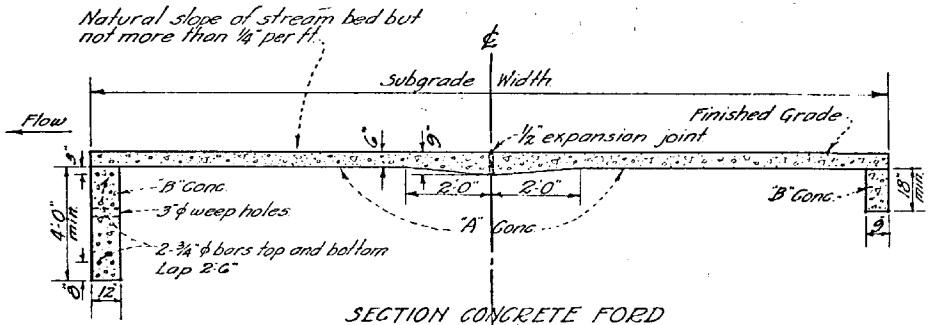
SECTION - BIT. MIX GUTTER IN CUT.

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

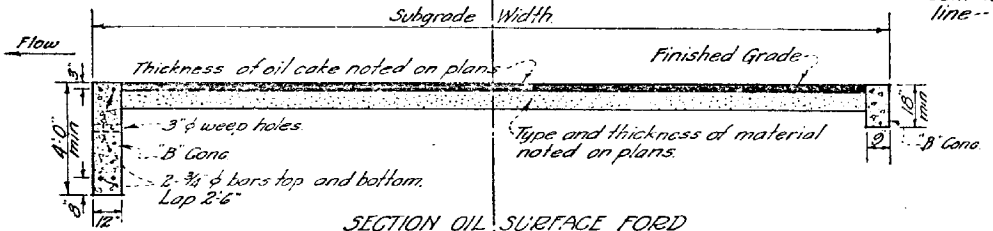
REV. 8-1-41

FLARES, CURBS, GUTTERS AND SIDE ROAD ENTRANCES

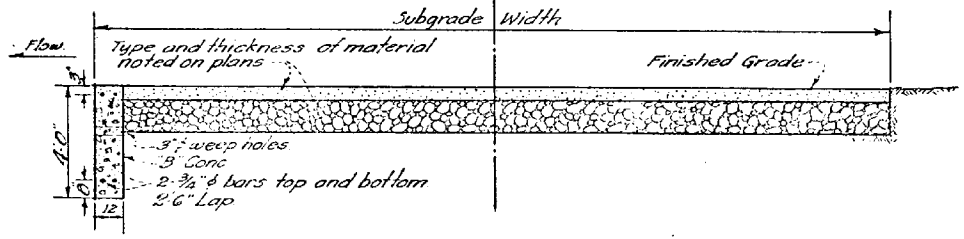
DRAWN	W.M.D.	JAN. 1938	DRAWING NO.
TRACED	K.S.	JUNE, 1938	A-8
CHECKED	[illegible]	[illegible] 1938	
APPROVED ENGR. PLANS	[illegible]		



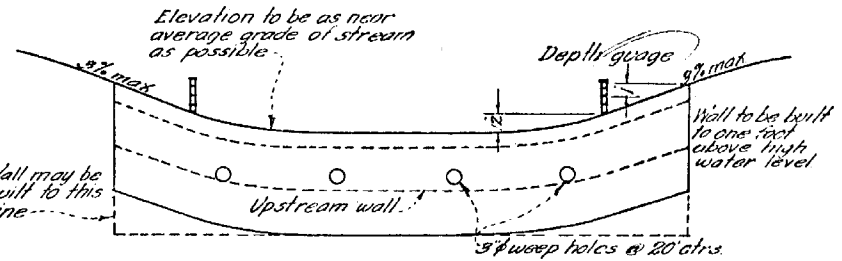
SECTION CONCRETE FORD
Conc Walls



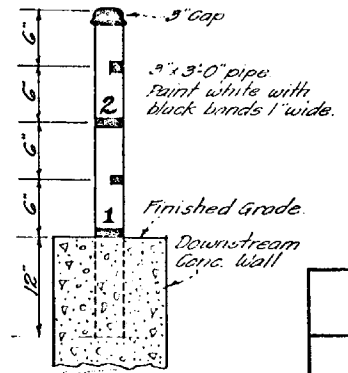
SECTION OIL SURFACE FORD
Conc Walls



SECTION UNPAVED FORD
Conc Wall



ELEVATION LOOKING UPSTREAM



DEPTH GUAGE INSTALLATION

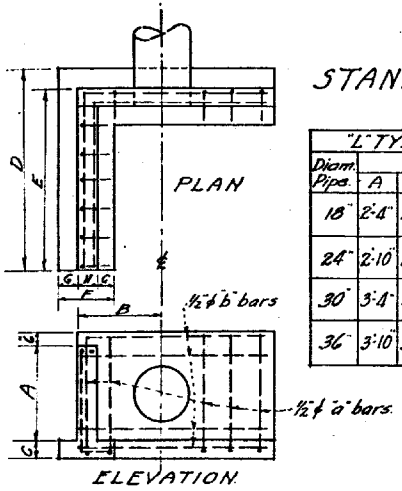
ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

STANDARD FORD NO. 1
CONCRETE WALLS

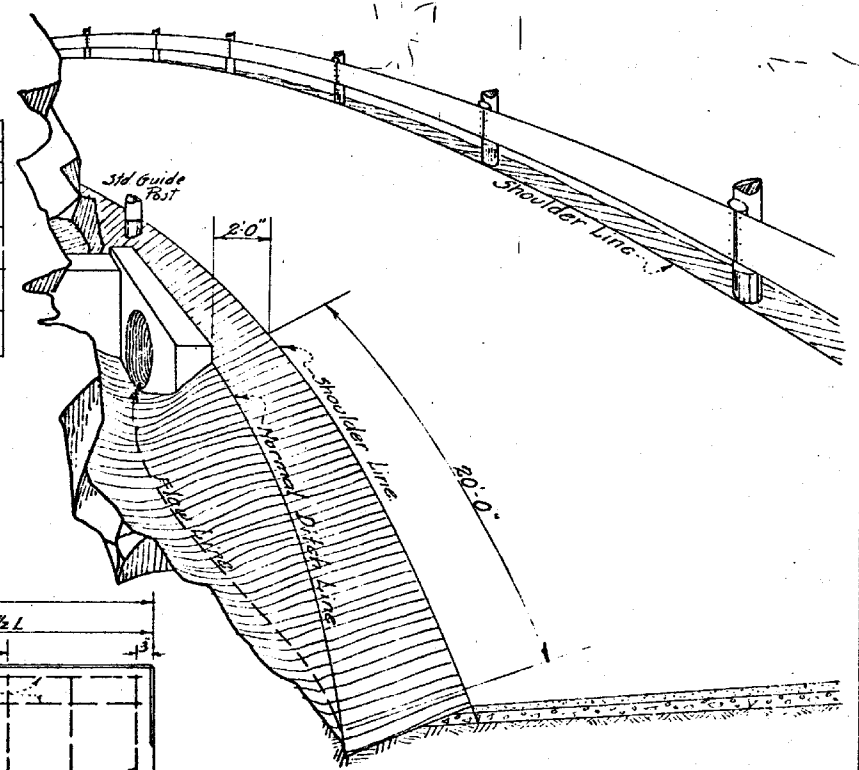
DRAWN BY	W.M.D. MAR 1932	DRAWING No.
TRACED BY	K.S. JULY 1933	A-9
CHECKED BY	H.H.W. JULY 1933	
APPROVED BY Engr. of Plans	E. L. Miller	

STANDARD "L" TYPE HEADWALLS



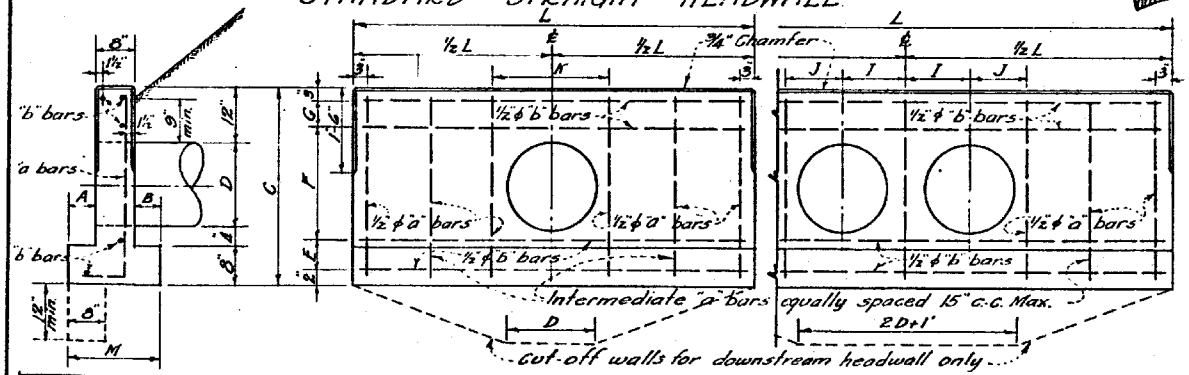
"L" TYPE REINFORCED HEADWALLS – SINGLE PIPES												
Diam. Pipe	DIMENSIONS								"A" Conc. One Wall	STEEL		Weight
	A	B	C	D	E	F	G	H		"a" bars	"b" bars	
18"	2'-4"	2'-0"	8"	5'-0"	4'-6"	1'-8"	6"	8"	.95 C.Y.	5-½"ϕ x 4'-0" 4-½"ϕ x 3'-6"	5-½"ϕ x 5'-3" 4-½"ϕ x 4'-3"	51 lbs.
24"	2'-10"	2'-6"	8"	6'-2"	5'-6"	2'-0"	8"	8"	1.36 C.Y.	5-½"ϕ x 4'-9" 5-½"ϕ x 4'-3"	5-½"ϕ x 6'-3" 4-½"ϕ x 5'-3"	64 "
30"	3'-4"	3'-9"	8"	7'-2"	6'-6"	2'-0"	8"	8"	1.94 C.Y.	7-½"ϕ x 5'-3" 6-½"ϕ x 4'-9"	5-½"ϕ x 8'-9" 4-½"ϕ x 6'-3"	88 "
36"	3'-10"	5'-0"	8"	8'-2"	7'-6"	2'-4"	10"	8"	2.75 C.Y.	9-½"ϕ x 6'-0" 7-½"ϕ x 5'-6"	5-½"ϕ x 11'-3" 4-½"ϕ x 7'-3"	117 "

Note:- All un-noted dimensions and size and spacing of reinforcing bars, same as shown on details of straight type headwalls.



TYPICAL INSTALLATION OF "L" TYPE HEADWALL.

STANDARD STRAIGHT HEADWALL



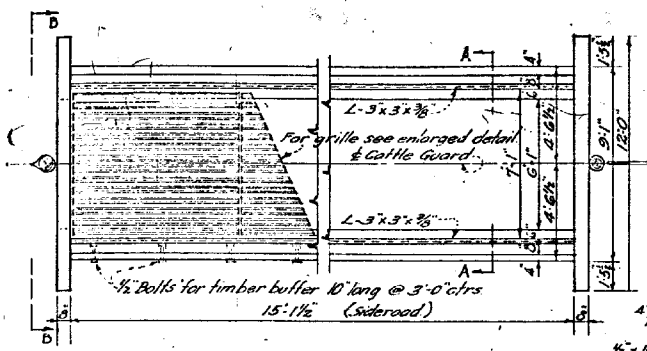
STRAIGHT TYPE REINFORCED CONCRETE HEADWALLS FOR 18" TO 36" PIPES.																											
Diam Pipe "D"	SINGLE TYPE HEADWALLS													DOUBLE PIPE HEADWALLS													
	DIMENSIONS									"A" Conc. One Wall	STEEL			DIMENSIONS										"A" Conc. One Wall	STEEL		
	A	B	C	E	F	G	K	L	M		"a" bars	"b" bars	Weight	A	B	C	E	F	G	L	M	I	J		"a" bars	"b" bars	Weight
18"	6"	6"	3'-6"	7"	2'-0"	6"	2'-0"	7'-0"	1'-8"	.95 C.Y.	5-½"ϕ x 4'-0"	5-½"ϕ x 6'-6"	37 lbs	6"	6"	3'-6"	7"	2'-0"	6"	9'-3"	1'-8"	3'-2"	1'-0"	.94 C.Y.	7-½"ϕ x 4'-0"	5-½"ϕ x 9'-0"	48 lbs
24"	8"	8"	4'-0"	8"	2'-4"	7"	2'-6"	8'-0"	2'-0"	.98 "	6-½"ϕ x 4'-8"	5-½"ϕ x 7'-8"	44 "	8"	8"	4'-0"	8"	2'-4"	7"	11'-0"	2'-0"	1'-6"	1'-3"	1.29 "	7-½"ϕ x 4'-8"	5-½"ϕ x 10'-8"	57 "
30"	8"	8"	4'-6"	8"	2'-10"	7"	3'-0"	10'-6"	2'-0"	1.39 "	8-½"ϕ x 5'-2"	5-½"ϕ x 10'-2"	62 "	8"	8"	4'-6"	8"	2'-10"	7"	14'-0"	2'-0"	1'-9"	1'-6"	1.77 "	9-½"ϕ x 5'-2"	5-½"ϕ x 13'-8"	76 "
36"	12"	8"	5'-0"	8"	3'-4"	7"	3'-6"	13'-0"	2'-6"	1.97 "	10-½"ϕ x 6'-0"	5-½"ϕ x 12'-8"	82 "	12"	8"	5'-0"	8"	3'-4"	7"	17'-0"	2'-4"	2'-0"	1'-9"	2.45 "	11-½"ϕ x 6'-0"	5-½"ϕ x 16'-8"	99 "

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

STD. STRAIGHT HEADWALLS
" L TYPE HEADWALLS

DRAWN	W.M.C.	MAY, 1936	DRAWING NO.
TRACED	K.S.	JUNE, 1938	A-13
CHECKED	HHW	[illegible]	
APPROVED HIGH. PLANS	C. H. Rhodes		

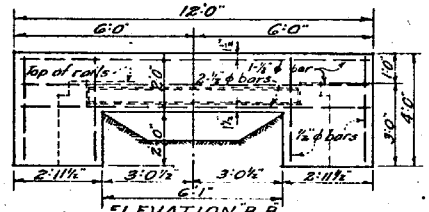


GENERAL PLAN

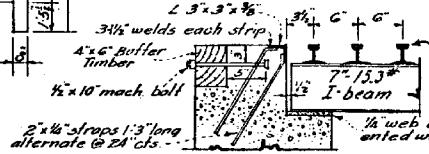
Paint Note:-
Shop Coat - All rails and structural steel to be painted 1 coat paint No. 1 spec. 4-7. All cedar posts 1 coat paint No. 7 and 1 coat paint No. 8.

Chamfer all exposed corners as shown unless otherwise noted

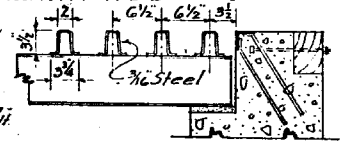
NOTE:- No buffer seat required on 15'-1 1/2" sideroad guard.



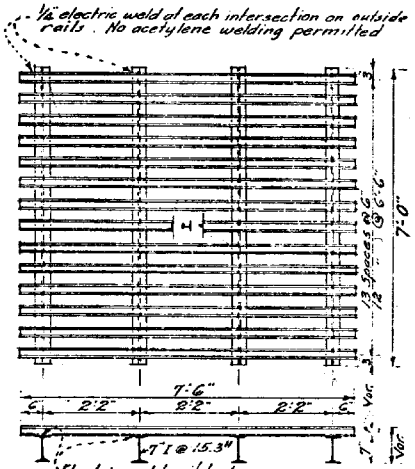
ELEVATION B-B



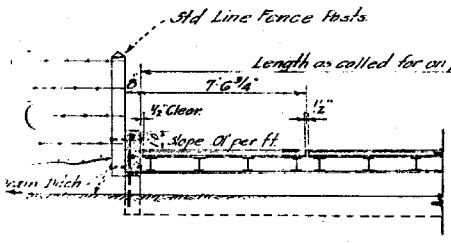
PART SECTION A-A
Rail Treads.

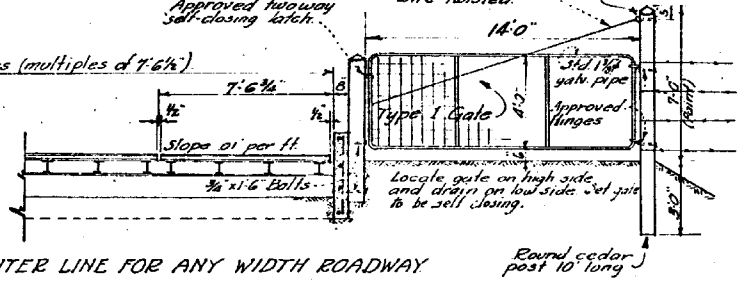


PART SECTION "A-A"
U Type Treads

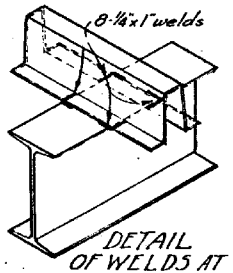


DETAIL OF WELDED GRILLE UNIT





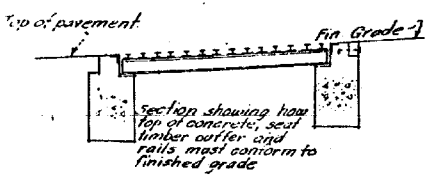
SECTION ON CENTER LINE FOR ANY WIDTH ROADWAY

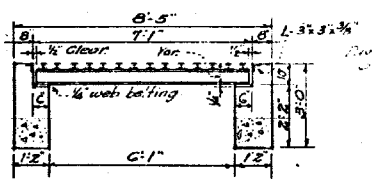


DETAIL OF WELDS AT EACH INTERSECTION (Rail or U Tread)

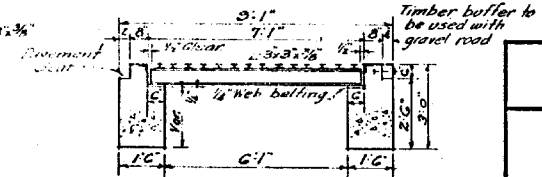
MATERIAL LIST					
Item	Pcs	Size	Length	Steel #	Conc. C.Y.
Common to all guard lengths					
Post, Round cedar	2		5'-6 min.		
" "	1		8'-0" "		
Bolts	4	3/4"ϕ	1'-6"		
Reinf. Bars	8	1/2"ϕ	11'-6"	60.70	
" "	3	"	3'-6"	18.48	
Gate	1	4'-0" x 14'-0"		Complete	
2 Unit - Sideroad					
Concrete					5.23
Fabricated L	2	7"x3"x3/8"x15'-1 1/2"		252	
Web Belting	1/2	6"x6"x1/4"			
3 Unit - 24' Roadway					
Concrete					8.35
Fabricated L	2	7"x3"x3/8"x22'-8"		377	
Web belting	24	6"x6"x1/4"			
4 Unit - 29' & 30' Roadway					
Concrete					10.53
Fabricated L	2	7"x3"x3/8"x30'-7 1/2"		504	
Web Belting	32	6"x6"x1/4"			
5 Unit - 32' & 36' Roadways					
Concrete					12.71
Fabricated L	2	7"x3"x3/8"x37'-8"			
Web belting	40	6"x6"x1/4"			

NOTE: Second hand rails may be used providing they are clean, free from rust scales, of uniform cross section and weighing at least 95% of original nominal weight. 23 lbs. Min.





FOR SIDEROAD ONLY
No buffer seat required.



FOR ROADWAYS OF 24' OR MORE
SECTION A-A.

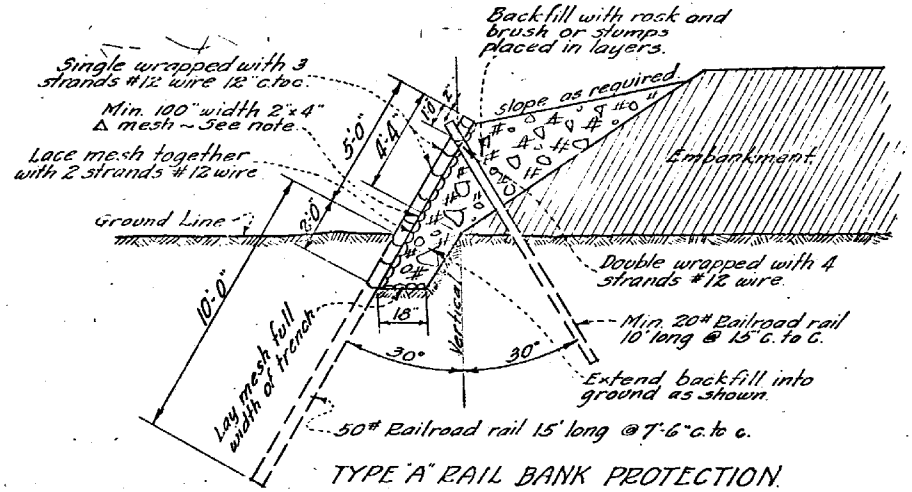
ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV. Weld 3/15/41

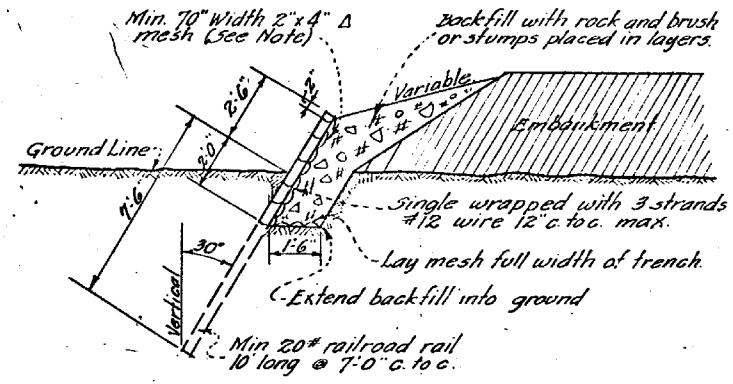
STD. CATTLE GUARDS

DRAWN	W.M.D.	MAY, 1936
TRACED	K.S.	JUNE, 1938
CHECKED	H.H.W.	July 1938
APPROVED ENGR. PLANS	E. A. Miller	

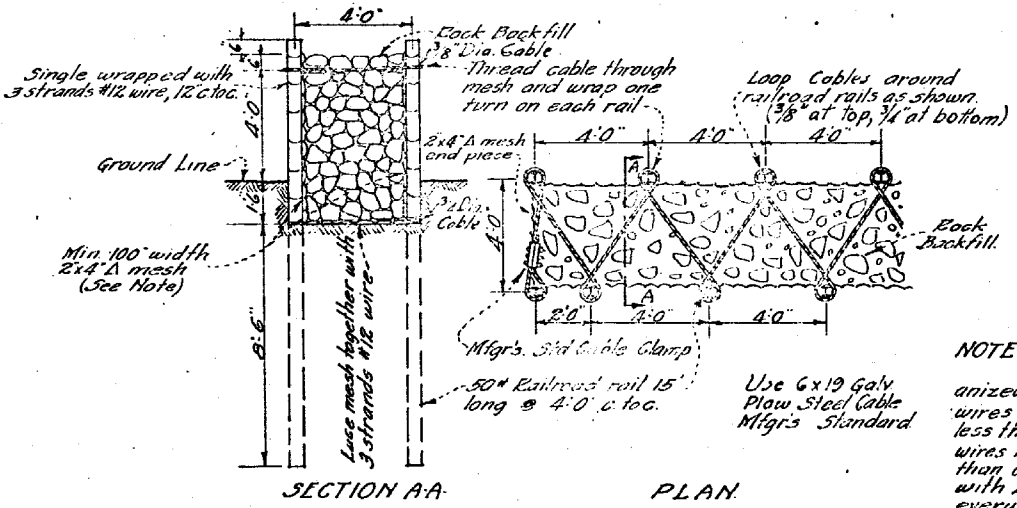
DRAWING NO. A-14



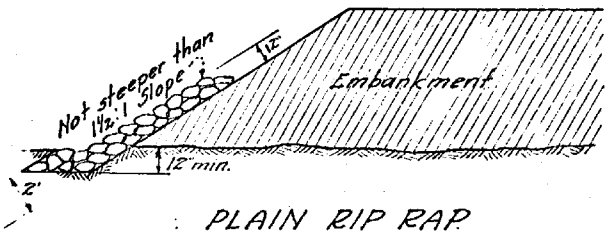
TYPE "A" RAIL BANK PROTECTION



TYPE "B" RAIL BANK PROTECTION



TYPE "C" RAIL BANK PROTECTION

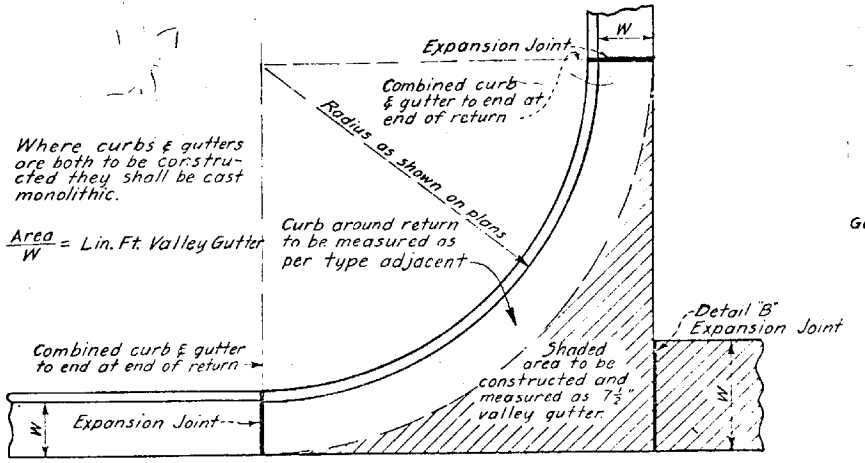


PLAIN RIP RAP

NOTE:

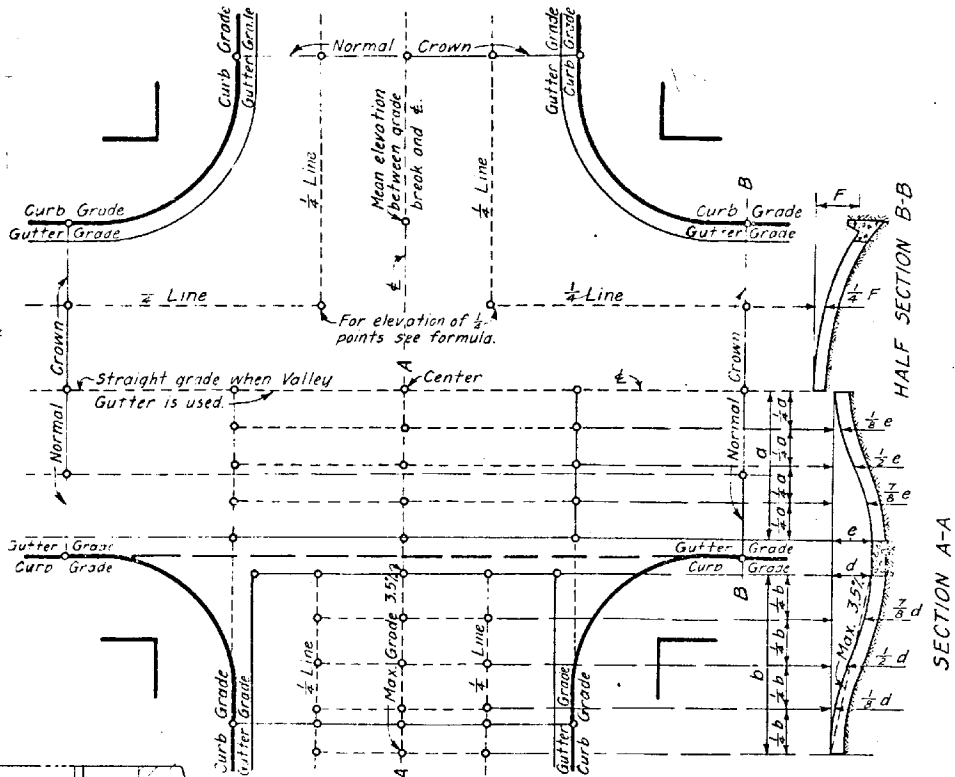
Wire mesh to be either galvanized or galvanealed. Horizontal wires to be 2 strands, twisted, not less than 12½ gauge. Vertical cross wires not less than 14 gauge. Where more than one width is used, lace together with 2 strands #12 wire and tie at every rail. All wire to be galvanized as per std. specs. Part 4, Sec. 3.

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION			REV.
RAIL BANK PROTECTION PLAIN RIP RAP			
DRAWN	H.A.K.	JUNE 1935	DRAWING NO.
TRACED	K.S.	JUNE 1938	A-15
CHECKED	[illegible]	June [illegible]	
APPROVED ENGR. PLANS	[illegible]		



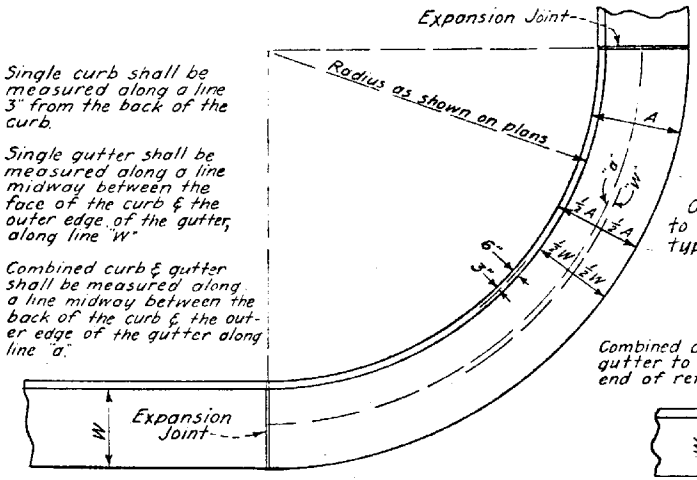
TYPICAL CONSTRUCTION OF VALLEY GUTTER AT STREET INTERSECTION OR ALLEY

W = width as shown on plans.

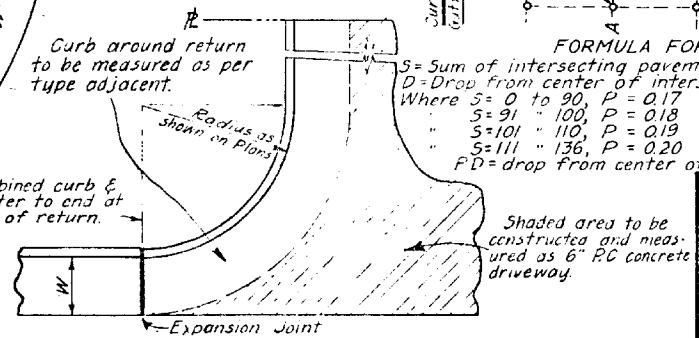


FORMULA FOR QUARTER POINTS

S = Sum of intersecting pavement widths.
D = Drop from center of intersection to center of return.
Where S = 0 to 90, P = 0.17
" S = 91 " 100, P = 0.18
" S = 101 " 110, P = 0.19
" S = 111 " 136, P = 0.20
PD = drop from center of intersection to the quarter point.

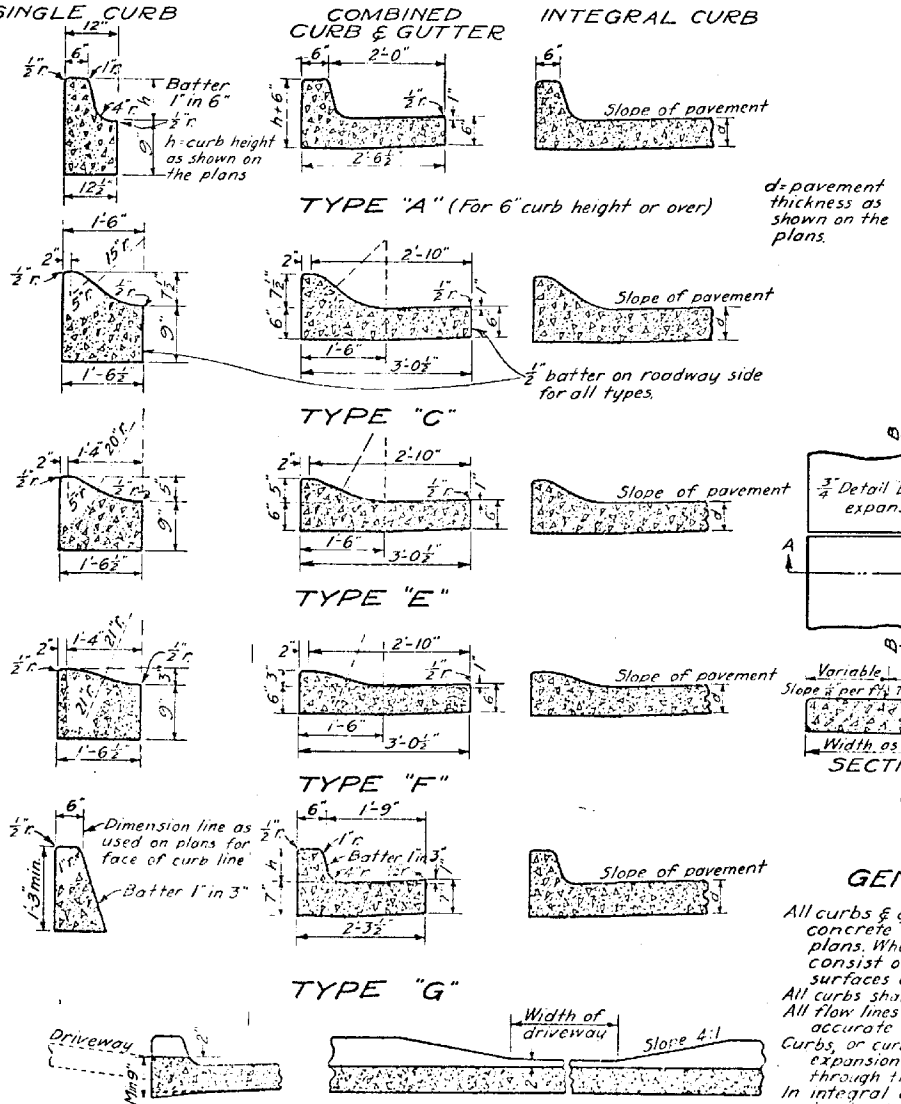


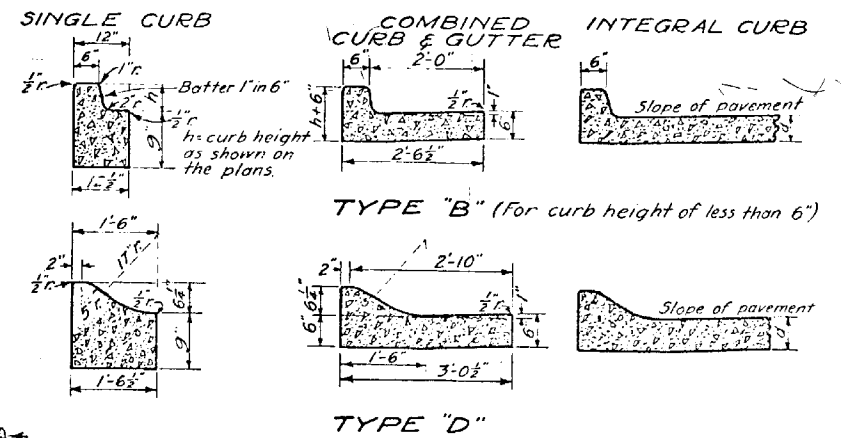
MEASUREMENT OF CURB, GUTTER OR COMBINED CURB & GUTTER ON CURVES

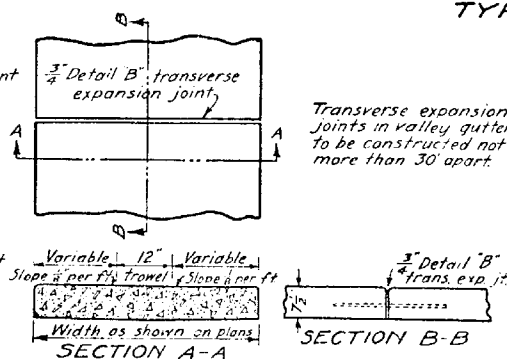


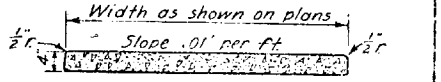
TYPICAL CONSTRUCTION OF CEMENT CONCRETE ALLEYS OR DRIVEWAYS

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION		REV.
CURB & GUTTER MEASUREMENT AND STREET INTERSECTION GRADES		
DRAWN	C.H. & W.M.D. 1935-36	DRAWING NO.
TRACED	H.A.K. JUNE, 1938	A-17
CHECKED	H.H.W. JULY 1938	
APPROVED ENGR. PLANS	E. J. Mehrer	







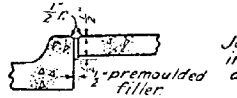


Sidewalk shall be single course Class "A" concrete, float finished and shall be marked in squares.

A ¼" open expansion joint shall be placed every 15 ft and a ½" premoulded filler joint between sidewalk & curb, as shown in detail below.

Sidewalk across driveways shall be 6" thick.

CONCRETE SIDEWALK



Joint filler shall be included & measured as sidewalk.

EXPANSION JOINT BETWEEN CURB & SIDEWALK

GENERAL NOTES

All curbs & gutters to be single course Class "A" concrete unless otherwise specified on the plans. Where plaster coat is called for it shall consist of ½" of 1:2 cement mortar on exposed surfaces of curb & gutter.

All curbs shall be trowel finished.

All flow lines of gutters shall be troweled to an accurate grade for a width of 9".

Curbs, or curb & gutter shall have a ¼" open expansion joint, extending all the way through the concrete, every 20 feet.

In integral curb all expansion & contraction joints shall extend through the curb.

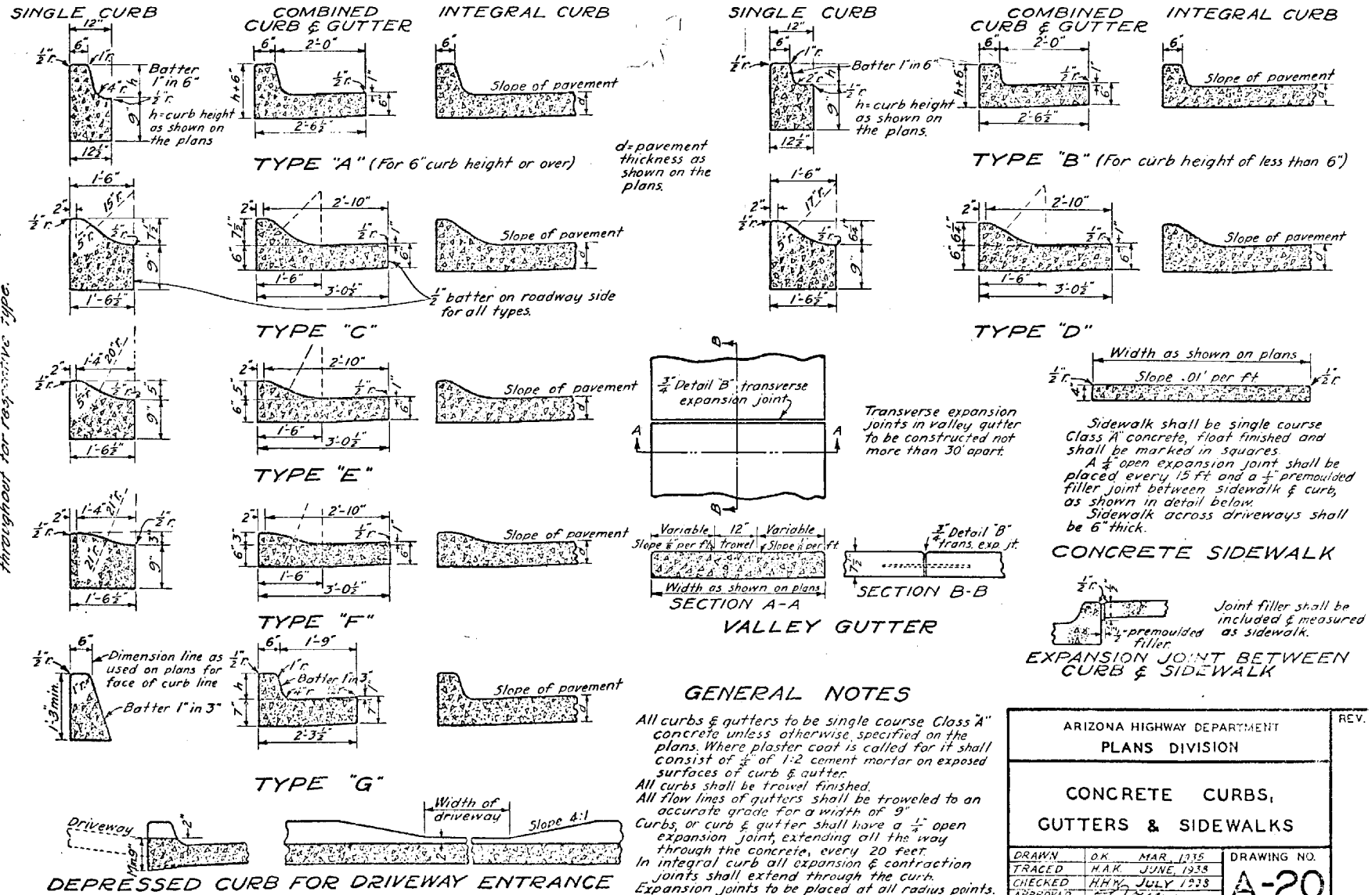
Expansion joints to be placed at all radius points.

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV

CONCRETE CURBS, GUTTERS & SIDEWALKS

DRAWN	O.K. MAR. 1935	DRAWING NO.
TRACED	H.A.K. JUNE 1938	A-20
CHECKED	H.H.K. JULY 1938	
APPROVED ENGR. PLANS		



GENERAL NOTES

All curbs & gutters to be single course Class "A" concrete unless otherwise specified on the plans. Where plaster coat is called for it shall consist of 1/2" of 1:2 cement mortar on exposed surfaces of curb & gutter.

All curbs shall be trowel finished.

All flow lines of gutters shall be troweled to an accurate grade for a width of 9".

Curbs, or curb & gutter shall have a 1/4" open expansion joint, extending all the way through the concrete, every 20 feet.

In integral curb all expansion & contraction joints shall extend through the curb.

Expansion joints to be placed at all radius points.

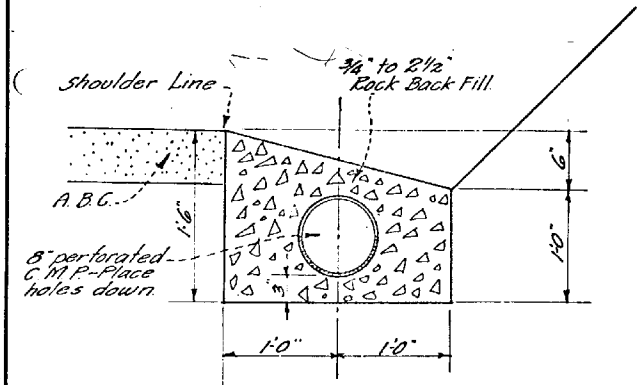
ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

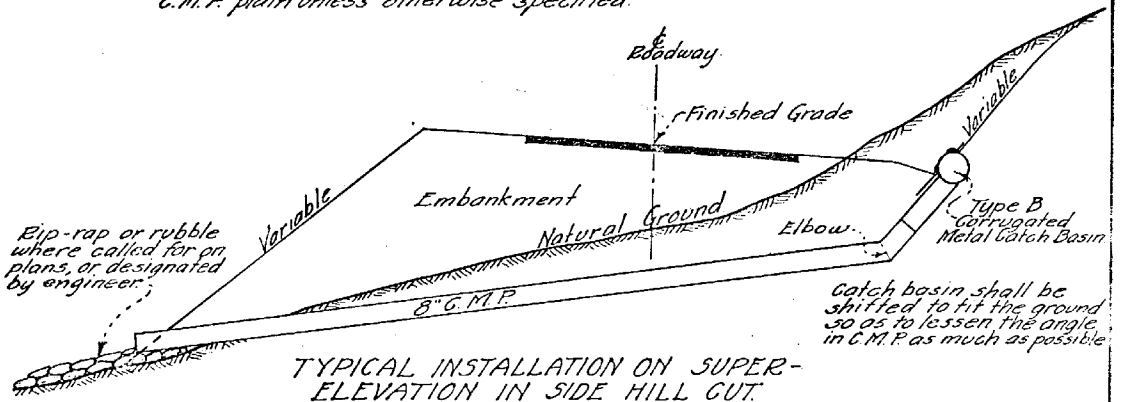
CONCRETE CURBS, GUTTERS & SIDEWALKS

DRAWN	O.K.	MAR. 1935	DRAWING NO.
TRACED	H.A.K.	JUNE, 1938	A-20
CHECKED	H.H.W.	JULY 1938	
APPROVED ENGR. OF PLANS			

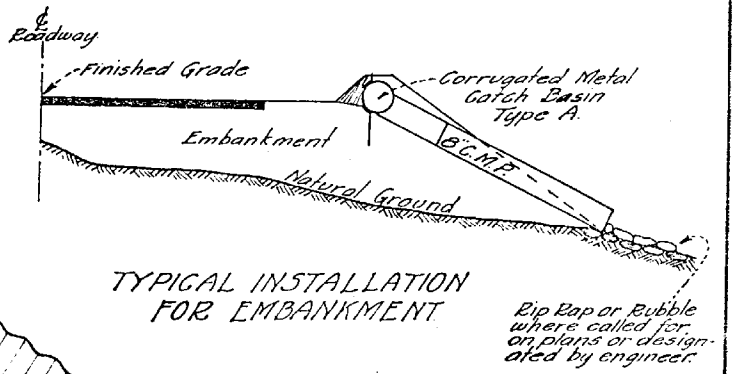
NOTE: Include elbow as part of total length.
Call for hinged band coupling for pipe joints. Use 12" band width where pipe is longer than 12', 7" band width O.K. for 12' or less.
Catch Basin to have bituminus coating.
C.M.P. plain unless otherwise specified.



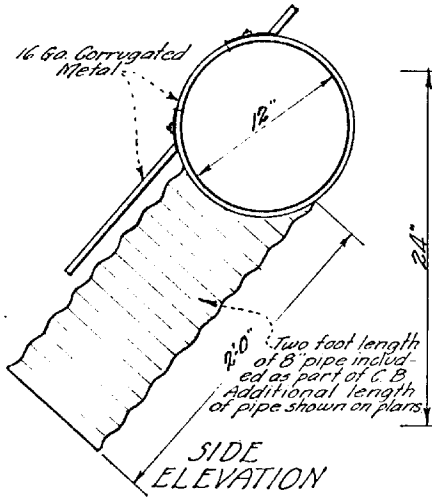
TYPICAL INSTALLATION OF PERFORATED C. M. P.



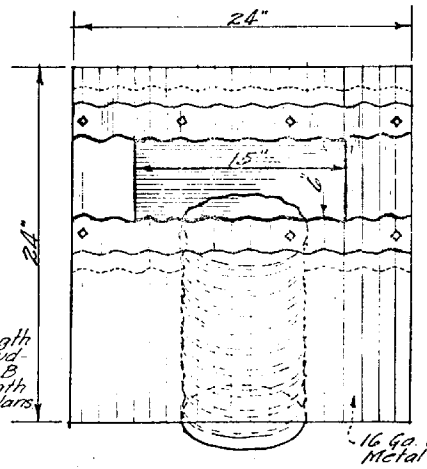
TYPICAL INSTALLATION ON SUPER-ELEVATION IN SIDE HILL CUT.



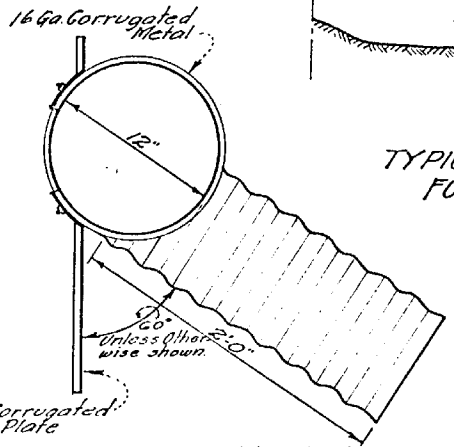
TYPICAL INSTALLATION FOR EMBANKMENT



SIDE ELEVATION
TYPE B.

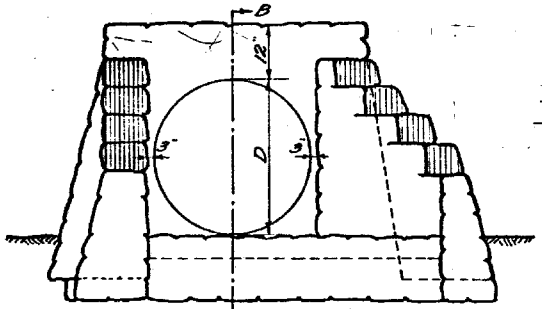


FRONT ELEVATION.
CATCH BASINS.



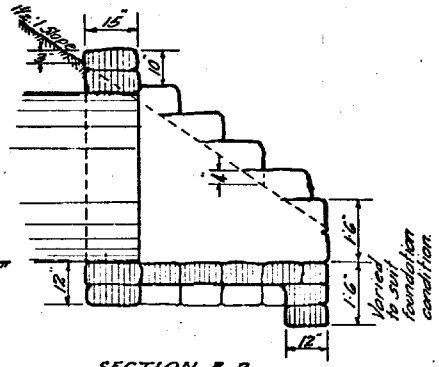
SIDE ELEVATION
TYPE A.

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION			REV.
PERFORATED C.M.P. & CORRUGATED METAL CATCH BASINS			
DRAWN BY	W.M.D.	193-	DRAWING NO.
TRACED BY	K.S.	JUNE, 1933	A-23
CHECKED BY	H.H.W.	JULY 1933	
APPROVED ENGR OF PLANS			

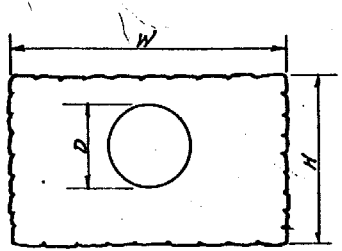


U TYPE WING TYPE

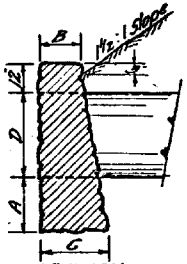
ELEVATION



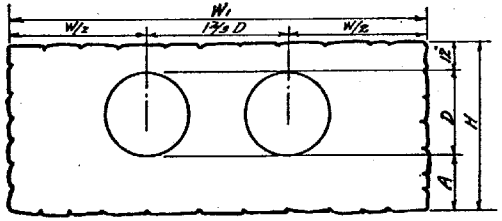
SECTION B-B



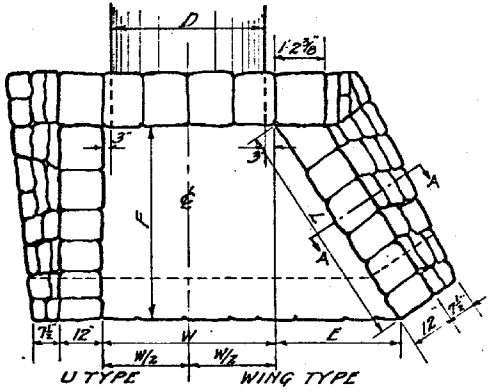
ELEVATION SINGLE



SECTION

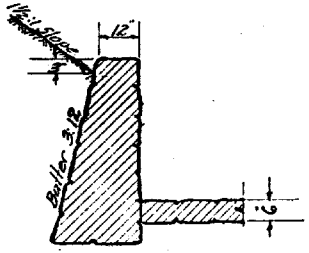


ELEVATION DOUBLE PIPE



U TYPE WING TYPE

PLAN



SECTION A-A

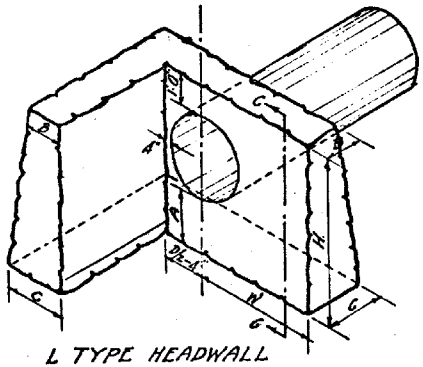
STRAIGHT TYPE HEADWALLS

Diam.	Dimensions				Single Pipe		Double Pipe	
D	A	B	C	H	W	C.R.M.C.Y.	W₁	C.R.M.C.Y.
18"	1'0"	1'6"	1'6"	3'6"	4'6"	0.78	7'0"	1.16
24"	1'4"	1'6"	1'10"	4'4"	6'4"	1.50	9'8"	2.20
30"	1'8"	1'6"	2'2"	5'2"	8'0"	2.48	12'2"	3.61
36"	2'0"	1'6"	2'6"	6'0"	10'0"	3.94	15'0"	5.66

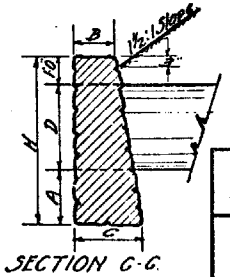
WING AND U TYPE HEADWALL ~ 30" TO 60" PIPES

Dimensions				Single Pipe			Double Pipe		
Diam.	Wing Type			Waterway	U Type	Wing Type	Waterway	U Type	Wing Type
D	L	T	F	Area S.F.	C.R.M.C.Y.	C.R.M.C.Y.	Area S.F.	C.R.M.C.Y.	C.R.M.C.Y.
30"	2'8½"	1'6"	2'3"	4.91	2.03	2.43	9.82	3.02	3.41
36"	3'7⅛"	2'0"	3'0"	7.07	2.63	3.19	14.14	4.15	4.47
42"	4'6"	2'6"	3'9"	9.62	3.35	4.08	19.24	5.03	5.76
48"	5'5"	3'0"	4'6"	12.56	4.16	5.08	25.12	6.25	7.17
54"	6'3½"	3'6"	5'3"	15.90	5.04	6.14	31.80	7.58	8.73
60"	7'2½"	4'0"	6'0"	19.63	6.02	7.40	39.26	9.08	10.44

NOTE: W for single pipes equals D+6'.
W for double pipes equals 2D+⅓D+6".



L TYPE HEADWALL



SECTION C-C

L TYPE HEADWALLS

Diam.	Dimensions						C.R.M. Cu. Yds.
D	A	B	C	H	W	L	
18"	1'0"	1'6"	1'6"	3'6"	2'3"	2'6"	1.33
24"	1'4"	1'6"	1'10"	4'4"	3'2"	3'6"	2.39
30"	1'8"	1'6"	2'2"	5'2"	4'0"	4'0"	3.73
36"	2'0"	1'6"	2'6"	6'0"	5'0"	5'0"	5.70

ARIZONA HIGHWAY DEPARTMENT

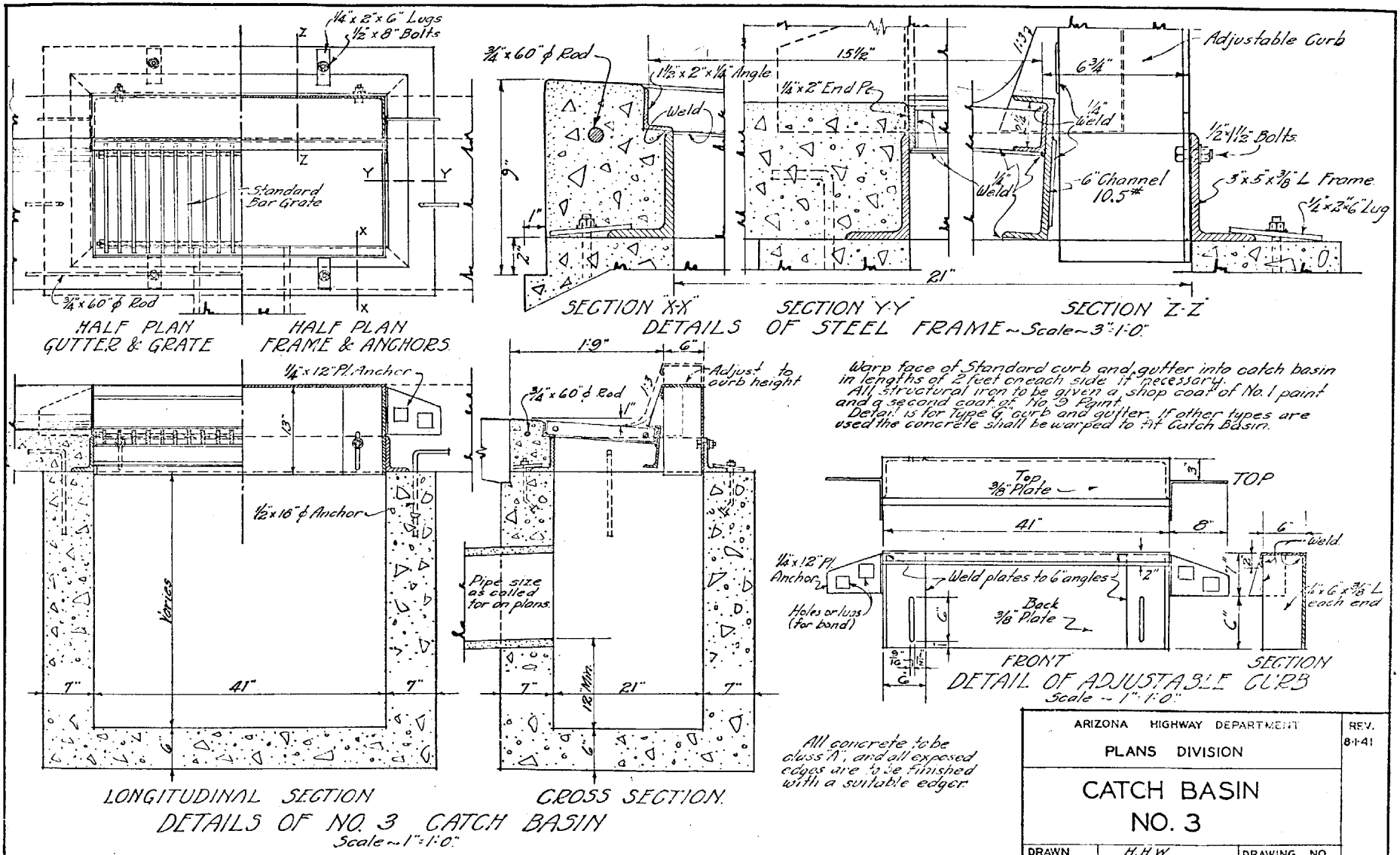
PLANS DIVISION

REV.

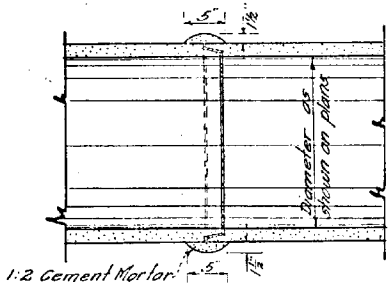
CEMENT RUBBLE MASONRY HEADWALLS

DRAWN BY	B.P.R.	DRAWING 1936
TRACED BY	K.S.	JUNE, 1938
CHECKED BY	H.H.W.	JULY 1938
APPROVED ENGR. OF PLANS		

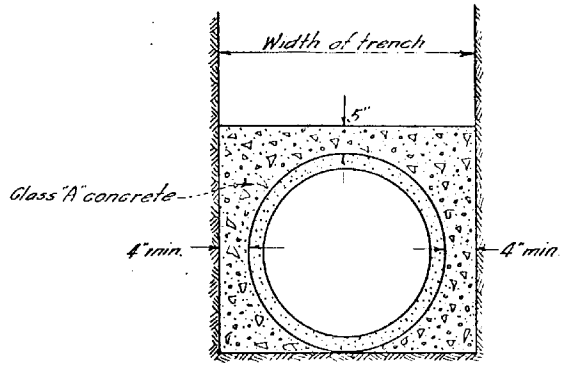
DRAWING NO. A-24



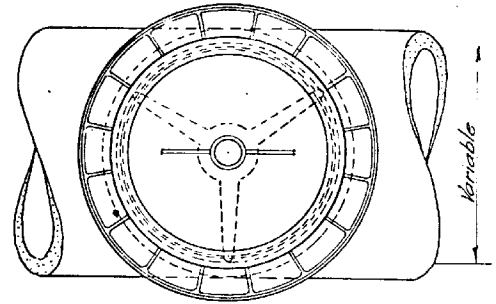
1/4" x 2" x 6" Lugs
1/2" x 8" Bolts
Standard Bar Grate
3/4" x 60" ϕ Rod
HALF PLAN GUTTER & GRATE
HALF PLAN FRAME & ANCHORS
3/4" x 60" ϕ Rod
1 1/2" x 2" x 1/4" Angle
Weld
1/4" x 2" End Pl.
15 1/2"
6 3/4"
Adjustable Curb
1/4" Weld
1/2" x 1 1/2" Bolts
6" Channel 10.5#
3" x 5" x 3/8" L Frame
1/4" x 2" x 6" Lug
21"
SECTION "X-X"
SECTION "Y-Y"
SECTION "Z-Z"
DETAILS OF STEEL FRAME ~ Scale ~ 3" = 1'-0"
1/4" x 12" Pl. Anchor
1/2" x 16" ϕ Anchor
Varies
41"
7"
1'-9"
6"
Adjust to curb height
3/4" x 60" ϕ Rod
Pipe size as called for on plans.
12" Min.
21"
LONGITUDINAL SECTION
CROSS SECTION
DETAILS OF NO. 3 CATCH BASIN
Scale ~ 1" = 1'-0"
Warp face of Standard curb and gutter into catch basin in lengths of 2 feet on each side if necessary.
All structural iron to be given a shop coat of No. 1 paint and a second coat of No. 9 Paint.
Detail is for Type "G" curb and gutter. If other types are used the concrete shall be warped to fit Catch Basin.
Top 3/8" Plate
TOP
41"
8"
6"
Weld
1/4" x 12" Pl. Anchor
Weld plates to 6" angles
Back 3/8" Plate
Holes or lugs (for bond)
1/4" x 6" x 3/8" L each end
FRONT
SECTION
DETAIL OF ADJUSTABLE CURB
Scale ~ 1" = 1'-0"
All concrete to be class "A", and all exposed edges are to be finished with a suitable edger.
ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION
REV. 8-1-41
CATCH BASIN NO. 3
DRAWN H.H.W.
TRACED K.S.
CHECKED H.H.W.
APPROVED
DRAWING NO. A-27



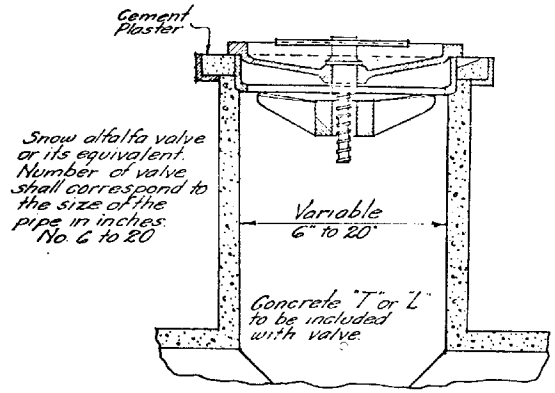
BEVELED END
CONCRETE PIPE



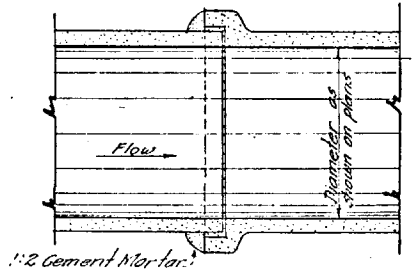
DETAIL "X"
CONCRETE ENCASEMENT



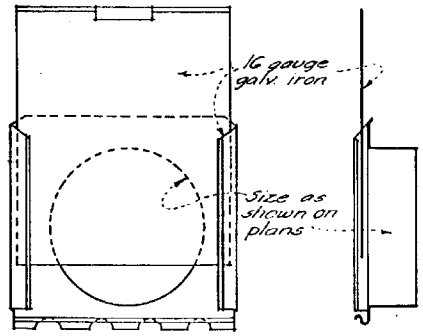
PLAN



PART SECTION
STANDARD IRRIGATION VALVE
DETAIL "C"

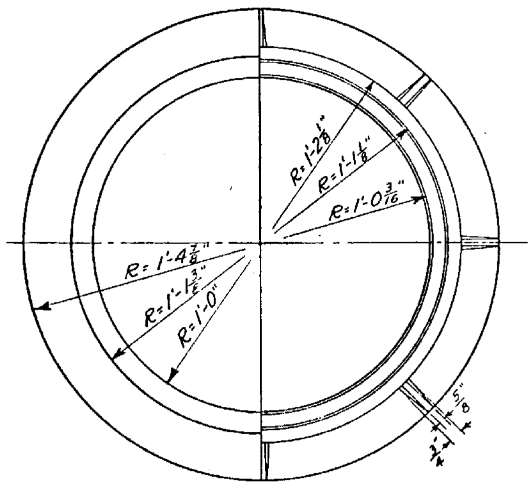


BELL & SPIGOT
CONCRETE PIPE, OR
VITRIFIED CLAY PIPE.

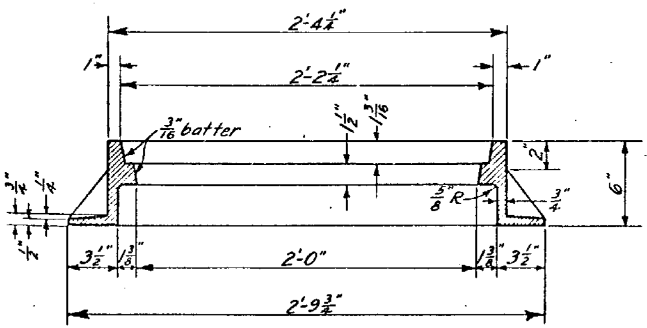


ELEVATION SECTION
STANDARD IRRIGATION GATE
DETAIL "O"

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION		REV.
CONCRETE & VIT. CLAY PIPE IRRIGATION VALVE IRRIGATION GATE		
Drawn	C.K. Dec. 35	DRAWING NO.
Traced	K.S. July 3[illegible]	A-28
Checked	H.H.W. July 1938	
Approved Eng. of Plans	E. [illegible]	



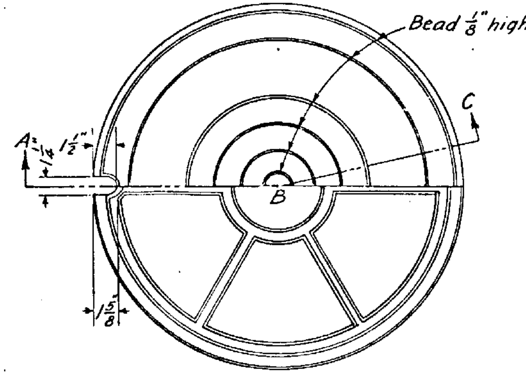
HALF PLAN BOTTOM OF FRAME   HALF PLAN TOP OF FRAME



SECTION OF FRAME

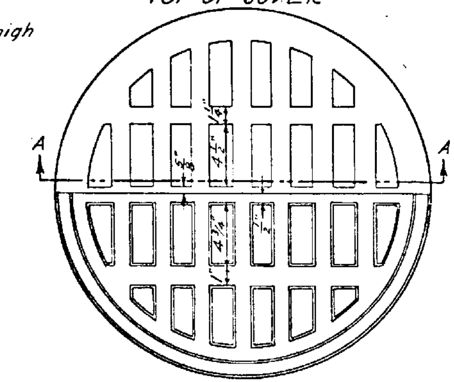
Approx. weight 205 lbs.

HALF PLAN TOP OF COVER

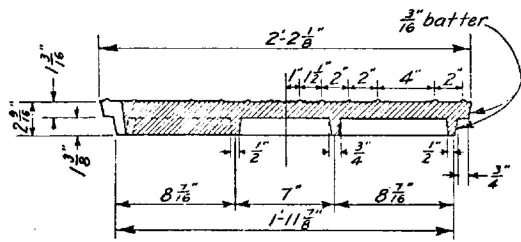


HALF PLAN BOTTOM OF COVER

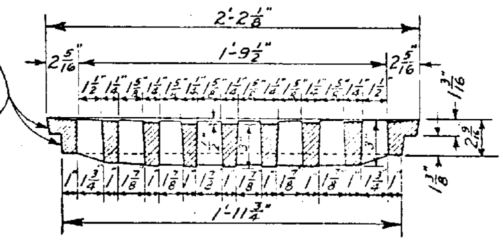
HALF PLAN TOP OF COVER



HALF PLAN BOTTOM OF COVER



SECTION A-B-C OF COVER



SECTION A-A OF COVER

TYPE "A" COVER
Approx. weight 190 lbs.

TYPE "B" COVER
Approx. weight 280 lbs.

Scale $1\frac{1}{2}$" = 1'-0"

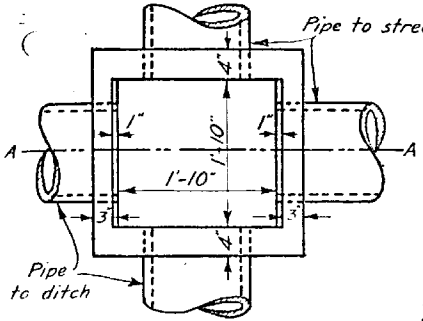
TYPE "A-1" COVER: shall be the same as Type "A" except that the cover shall be vented with at least six one inch holes equally spaced in a circle $8\frac{1}{2}$" from the center of the cover.

Type "A" cover shall be used unless otherwise specified.

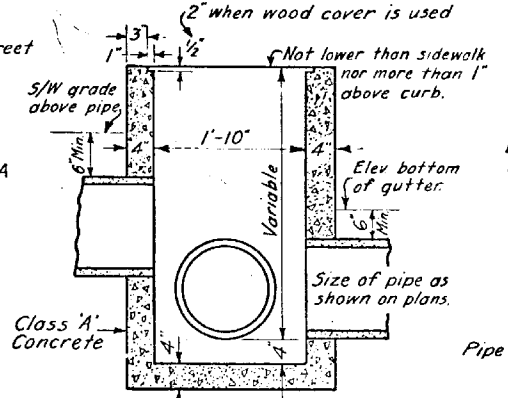
Notations as shown on the plans shall be as follows: Std. M.H. Frame & Cover No. 1-B, the letter denoting the type of cover.

The bearing faces shall be machined so that the cover will have a uniform bearing in any position in the frame.

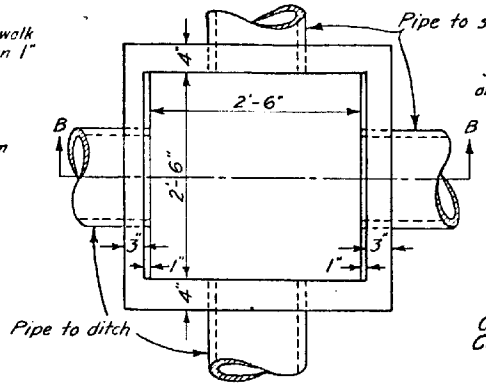
ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION		REV.
STANDARD MANHOLE FRAME & COVER NO. 1		
DRAWN BY O.H. OCT., 1935 TRACED BY H.A.K. JUNE, 1938 CHECKED BY H.H.W. JULY 1938 APPROVED ENGR. OF PLANS [signature]	DRAWING NO. A-29	



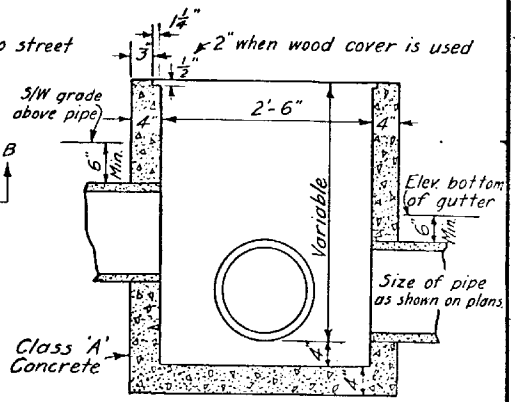
PLAN
STANDPIPE NO. 1



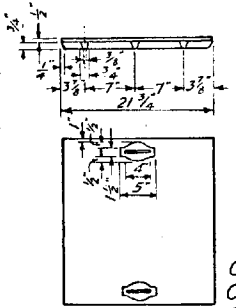
SECTION A-A

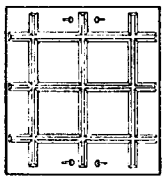


PLAN
STANDPIPE NO. 2

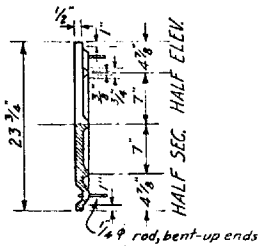


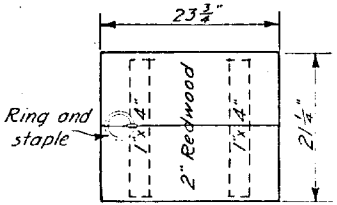
SECTION B-B





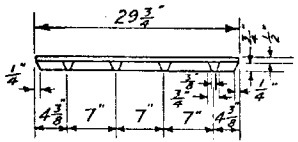
CAST IRON COVER FOR STANDPIPE NO. 1.

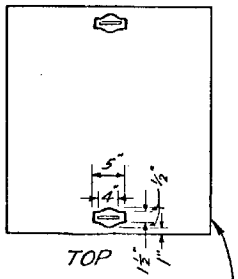


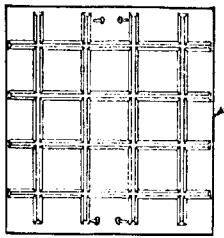


PLAN OF REDWOOD COVER FOR STANDPIPE NO. 1
Redwood cover to be used when top of standpipe is above sidewalk.

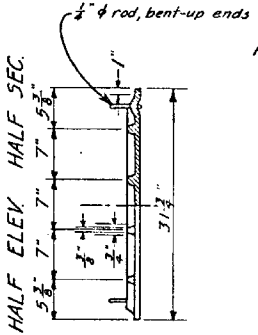
STANDARD IRRIGATION STANDPIPE NO. 1

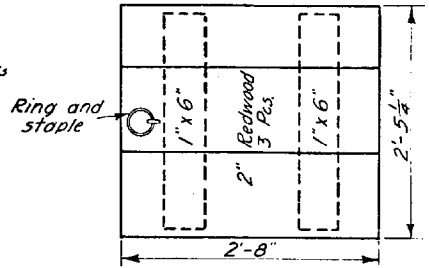






CAST IRON COVER FOR STANDPIPE NO. 2

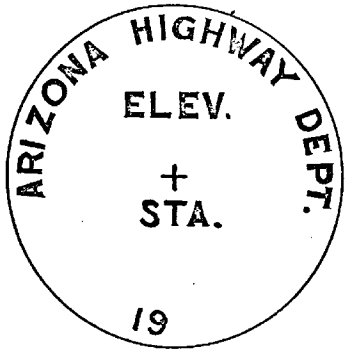




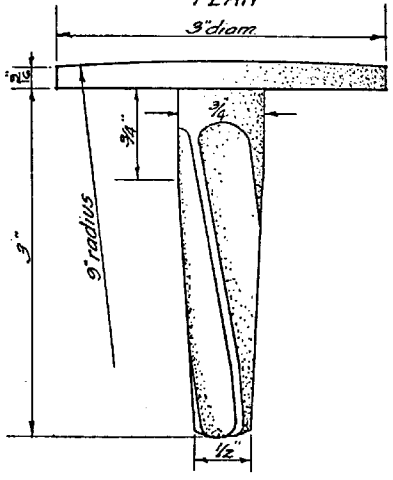
PLAN OF REDWOOD COVER FOR STANDPIPE NO. 2
Redwood cover to be used when top of standpipe is above sidewalk.

STANDARD IRRIGATION STANDPIPE NO. 2

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION		REV.
STANDARD IRRIGATION STANDPIPE NO. 1 & NO. 2		
DRAWN BY	PHOENIX STANDARD	DRAWING NO.
TRACED BY	H.A.M. JUNE, 1938	A-32
CHECKED BY	H.H.W. JULY 1938	
APPROVED ENGR. OF PLANS		

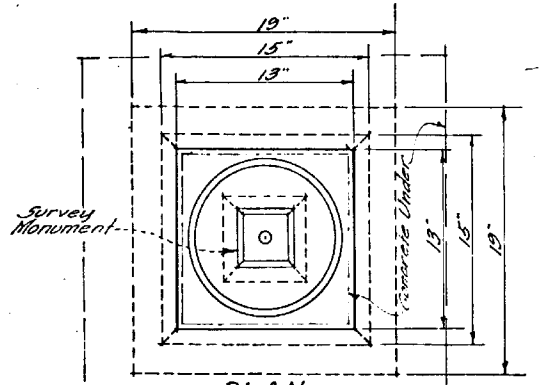


PLAN

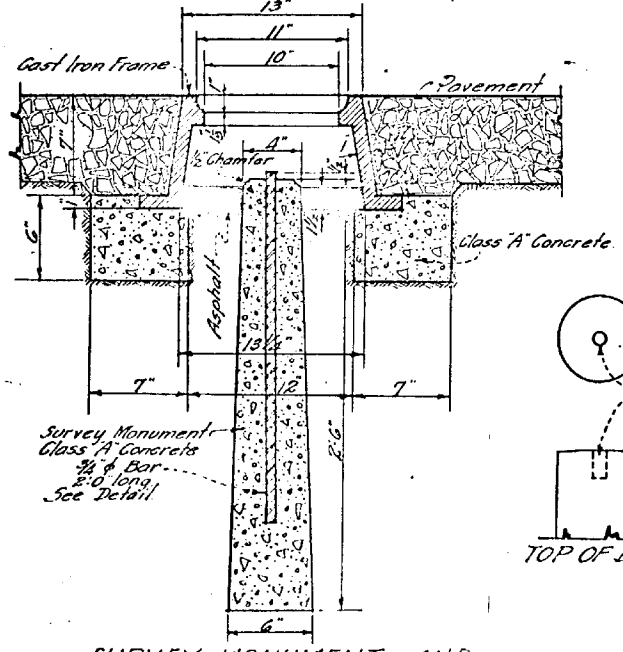


ELEVATION
Material to be of bronze or brass alloy

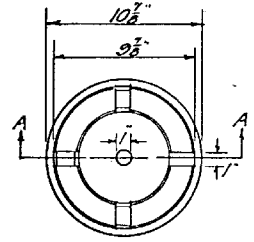
NOTE:- To be furnished by the State and installed and marked by the Resident Engineer on culvert headwalls, bridge curbs or abutment walls, survey monuments, F.A. project markers, or other permanent structures. Location and data shall be shown on as built plans.



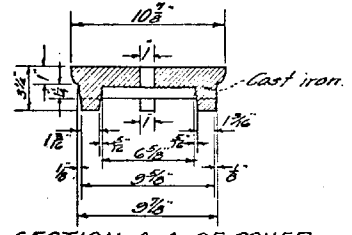
PLAN
Min. weight of frame 160#



SURVEY MONUMENT AND CAST IRON COVER INSTALLATION.
Scale ~ 1 1/2" = 1'-0"



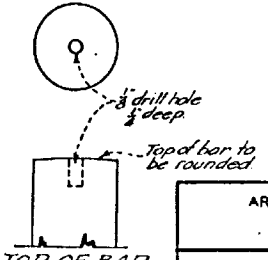
PLAN
BOTTOM OF COVER
Min. weight 36#



SECTION A-A OF COVER.

The contractor shall bid on the frame & cover complete in place.

Where new survey monuments are required they shall be placed by the contractor where located by the State.



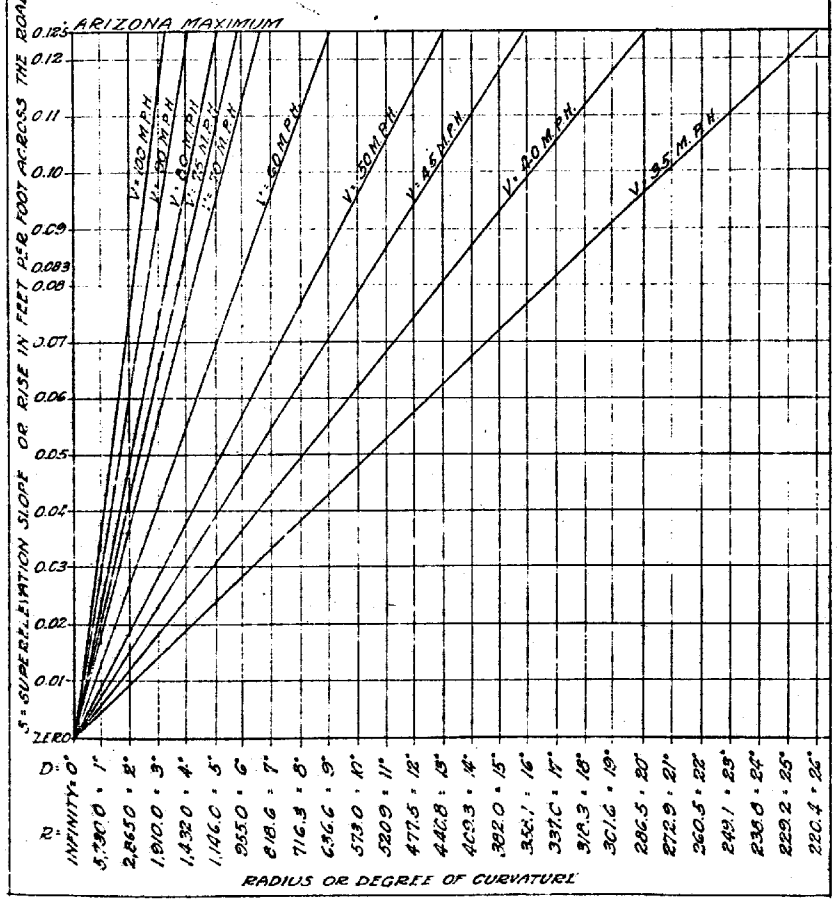
TOP OF BAR.

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION			REV.
STANDARD BENCH MARKER SURVEY MONUMENT AND COVER			
DRAWN BY	O.K.	Oct. 1935.	DRAWING NO. A-33
TRACED BY	K.S.	JULY 1938	
CHECKED BY	H.H.W.	JULY 1938	
APPROVED BY Engr. of Plans	C. Miller		

SUPERELEVATION CHART BASED ON SPEED.

Note:-
0.8175 V = Safe Speed
0.5773 V = Full Compensation

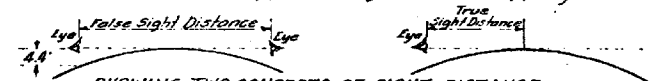
V = Designed or critical velocity in miles per hr. = $\sqrt{45SR}$
R = Radius of curve in feet.
D = Degree of curvature.
S = Superelevation slope in ft. per ft. across road = $\frac{V^2}{45R}$ = 0.00000388 V^2D.



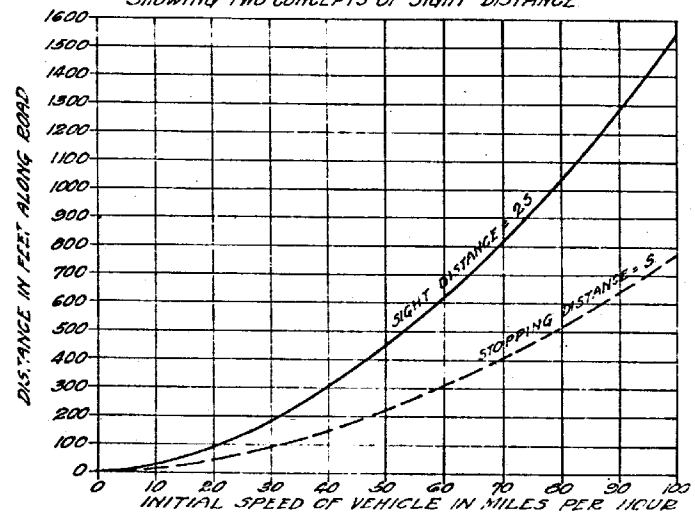
STOPPING DISTANCE & SIGHT DISTANCE

STOPPING DISTANCE:-
The total average stopping distance for one vehicle, considering average brakes and average reaction time, may be computed by the formula $S = \frac{V^2}{15} + 1.1V$.
In which:- S = The distance in feet along the road to stop.
V = Initial velocity of vehicle in miles per hour.

SIGHT DISTANCE:-
Sight distance should be double the stopping distance for the sake of two vehicles approaching, or as a stopping factor.



SHOWING TWO CONCEPTS OF SIGHT DISTANCE

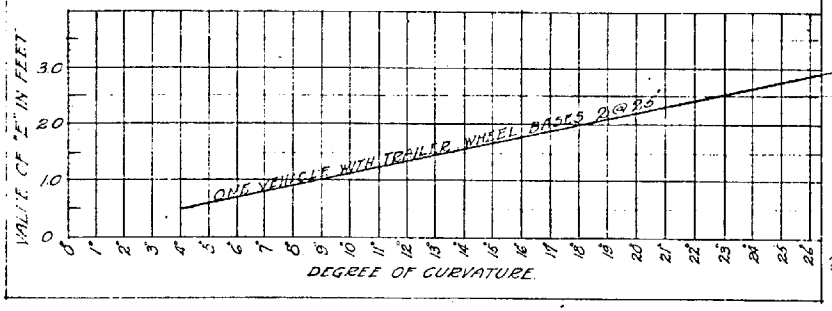


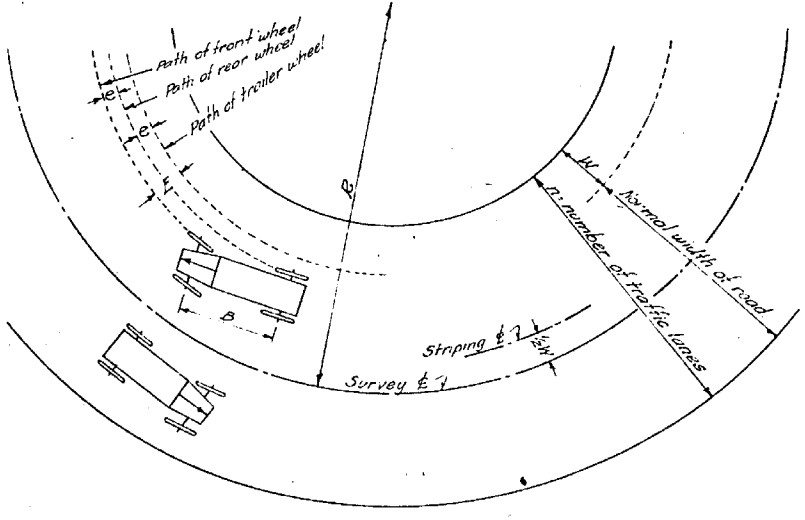
NOTE:-
Sight distance should be considered when selecting the designed or critical speed for horizontal and vertical curve limitations

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION		REV.
SUPERELEVATION AND SIGHT DISTANCE CHARTS		
COMPILED BY	LESLIE McDOUGALL '37	DRAWING NO.
TRACED BY	K.S. 4/7/38	A-37
CHECKED BY	H.H.W. July 1938	
APPROVED ENGR OF PLANS	E. J. Miller	

ENCROACHMENT CHART & CURVE WIDENING

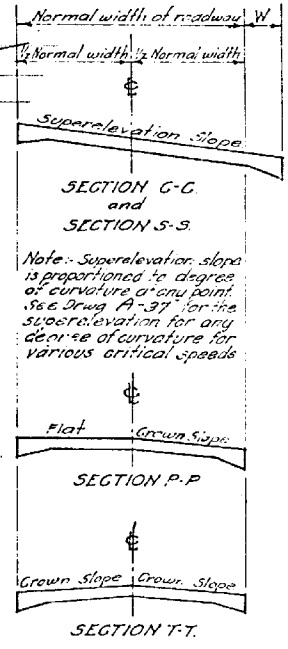
R = Radius of curve survey ℄ in ft. = 5729.58 ÷ Degree of curvature.
B = Wheel base in feet. For example 2.5'
e = Rear wheel encroachment in feet = $R - \sqrt{R^2 - B^2}$
E = Total encroachment assuming trailer with added "B" wheel base = 2e.
n = Number of traffic lanes across roadway.
W = En = Required curve widening in ft. to be added to normal road width. Always on inside of curve.

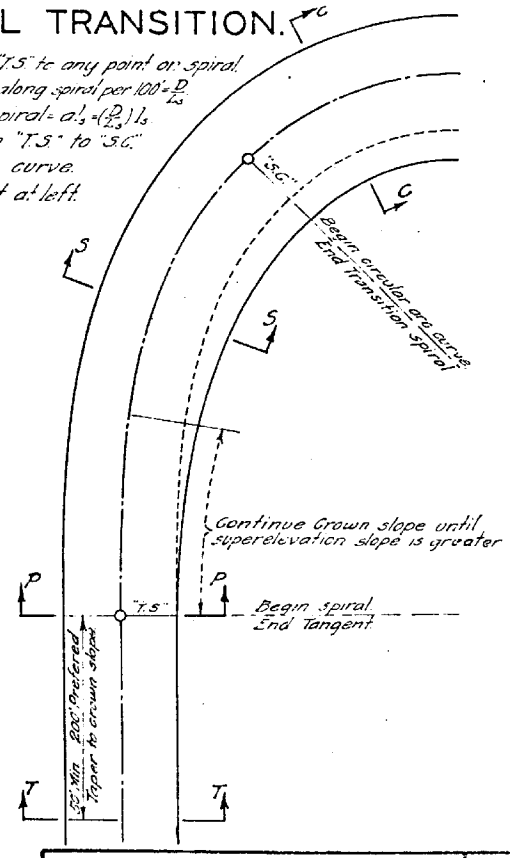




SUPERELEVATION & CURVE WIDENING WITH SPIRAL TRANSITION.

l_s = Length on spiral in 100' stations from "T.S." to any point on spiral.
a = Rate of change in degree of curvature along spiral per 100' = $\frac{D}{L_s}$
d = Degree of curvature at any point on spiral = $a l_s = (\frac{D}{L_s}) l_s$
L_s = Length of spiral in 100' stations from "T.S." to "S.C."
D = Degree of curvature of circular arc curve.
W = Curve widening. See detail and chart at left.





ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION		REV.
SURERELEVATION AND CURVE WIDENING WITH SPIRAL TRANSITION		
COMPILED BY	ESLIE McDOUGALL	DRAWING NO
TRACED BY	K.S.	A-38
CHECKED BY	H.H.W. July 1938	
APPROVED ENGR. OF PLANS	E. J. Miller	

TABLE-E

TRANSITION SPIRAL TABLE FOR HIGHWAY CURVES

60 MILES PER HOUR CRITICAL SPEED = 87.96 FEET PER SEC.
49 MILES PER HOUR SAFE SPEED.
35 MILES PER HOUR FULL COMPENSATION SPEED.
AVERAGE STOPPING DISTANCE INCLUDING REACTION 306 FEET EXCEPT ON ICE OR SLICK SURFACE.
$a = 1\frac{2}{3}$, RATE INCREASE IN DEGREES OF CURVATURE PER 100 FEET ALONG SPIRAL.

MISCELLANEOUS INFORMATION Beginning at or Initial Tangent	LENGTH ON SPIRAL IN FEET 100 L_s	D DEGREE OF CURVATURE aL_s	R RADIUS IN FEET 5729.58÷D	"O" OFFSET IN FEET $.0727aL_s^3$	t IN FEET $50L_s - .000127aL_s^3$	Δ_s SPIRAL DEVIATION $\frac{1}{2}aL_s^2$	θ DEFLECTION $\frac{1}{3}\Delta_s$	Φ DEFLECTION $\frac{2}{3}\Delta_s$	r IN FEET $\frac{c \sin\theta}{\sin\Delta_s}$	U IN FEET $\frac{c \sin\phi}{\sin\Delta_s}$	C IN FEET $100L_s - .00034aL_s^5$	SUPER-ELEVATION SLOPE FT. PER FT.
Time @ 60 M.P.H.	0	0°00'	INFINITY		0.00	0°00'00"	0°00'00"	0°00'00"	0.00	0.00	0.00	0.0000
Transition Spiral Unnecessary.	10	0°10'	34,377.48		5.00	0°00'30"	0°00'10"	0°00'20"	3.33	6.67	10.00	.0023
	20	0°20'	17,188.74		10.00	0°02'	0°00'40"	0°01'20"	6.67	13.33	20.00	.0046
	30	0°30'	11,459.16		15.00	0°04'30"	0°01'30"	0°03'	10.00	20.00	30.00	.0069
	40	0°40'	8,594.37	.01	20.00	0°08'	0°02'40"	0°05'20"	13.33	26.67	40.00	.0093
	50	0°50'	6,875.50	.02	25.00	0°12'30"	0°04'10"	0°08'20"	16.67	33.33	50.00	.0116
	60	1°00'	5,729.58	.03	30.00	0°18'	0°06'	0°12'	20.00	40.00	60.00	.0139
	70	1°10'	4,911.07	.04	35.00	0°24'30"	0°08'10"	0°16'20"	23.33	46.67	70.00	.0163
1 Second	80	1°20'	4,297.19	.06	40.00	0°33'	0°10'40"	0°21'20"	26.67	53.33	80.00	.0186
	90	1°30'	3,819.72	.09	45.00	0°40'30"	0°13'30"	0°27'	30.00	60.00	90.00	.0209
	100	1°40'	3,437.75	.12	50.00	0°50'	0°16'40"	0°33'20"	33.33	66.67	100.00	.0232
	110	1°50'	3,125.23	.16	55.00	1°00'30"	0°20'10"	0°40'20"	36.67	73.33	110.00	.0256
	120	2°00'	2,864.79	.21	60.00	1°12'	0°24'	0°48'	40.00	80.00	120.00	.0279
	130	2°10'	2,644.42	.26	65.00	1°24'30"	0°28'10"	0°56'20"	43.33	86.67	130.00	.0302
	140	2°20'	2,455.53	.33	70.00	1°38'	0°32'40"	1°05'20"	46.67	93.33	139.99	.0326
	150	2°30'	2,291.83	.41	75.00	1°52'30"	0°37'30"	1°15'	50.00	100.00	149.99	.0349
	160	2°40'	2,148.59	.50	80.00	2°08'	0°42'40"	1°25'20"	53.33	106.67	159.99	.0372
2 Seconds	170	2°50'	2,022.20	.59	85.00	2°24'30"	0°48'10"	1°36'20"	56.67	113.33	169.99	.0395
	180	3°00'	1,909.86	.70	90.00	2°42'	0°54'	1°48'	60.02	120.00	179.98	.0419
	190	3°10'	1,809.34	.83	94.99	3°00'30"	1°00'10"	2°00'20"	63.34	126.68	189.98	.0442
	200	3°20'	1,718.87	.97	99.99	3°20'	1°06'40"	2°13'20"	66.70	133.37	199.97	.0465
	210	3°30'	1,637.02	1.12	104.99	3°40'30"	1°13'30"	2°27'	70.02	140.03	209.96	.0488
	220	3°40'	1,562.61	1.29	109.98	4°02'	1°20'40"	2°41'20"	73.37	146.71	219.95	.0512
	230	3°50'	1,494.67	1.47	114.98	4°24'30"	1°28'10"	2°56'20"	76.72	153.36	229.94	.0535
	240	4°00'	1,432.40	1.67	119.97	4°48'	1°36'	3°12'	80.05	160.04	239.92	.0558
	250	4°10'	1,375.10	1.89	124.97	5°12'30"	1°44'10"	3°28'20"	83.41	166.75	249.91	.0582
3 Seconds	260	4°20'	1,322.21	2.13	129.96	5°38'	1°52'40"	3°45'20"	86.74	173.41	259.89	.0605
	270	4°30'	1,273.24	2.38	134.95	6°04'30"	2°01'30"	4°03'	90.10	180.10	269.86	.0628
	280	4°40'	1,227.77	2.66	139.94	6°32'	2°10'40"	4°21'20"	93.47	186.79	279.84	.0652
	290	4°50'	1,185.43	2.96	144.93	7°00'30"	2°20'10"	4°40'20"	96.81	193.48	289.81	.0675
	300	5°00'	1,145.92	3.27	149.91	7°30'	2°30'	5°00'	100.18	200.17	299.77	.0698
	310	5°10'	1,108.95	3.61	154.90	8°00'30"	2°40'10"	5°20'20"	103.55	206.87	309.73	.0722
	320	5°20'	1,074.30	3.97	159.88	8°32'	2°50'40"	5°41'20"	106.91	213.57	319.68	.0744
	330	5°30'	1,041.74	4.35	164.86	9°04'30"	3°01'50"	6°03'	110.29	220.28	329.63	.0768
	340	5°40'	1,011.10	4.76	169.84	9°38'	3°12'40"	6°25'20"	113.66	226.98	339.57	.0792
4 Seconds	350	5°50'	982.21	5.20	174.81	10°12'30"	3°24'10"	6°48'20"	117.06	233.68	349.50	.0814
	360	6°00'	954.93	5.65	179.79	10°48'	3°36'	7°12'	120.44	240.41	359.43	.0838
	370	6°10'	929.12	6.14	184.76	11°24'30"	3°48'10"	7°36'20"	123.83	247.15	369.35	.0861
	380	6°20'	904.67	6.65	189.72	12°02'	4°00'40"	8°01'20"	127.25	253.87	379.25	.0884
	390	6°30'	881.47	7.19	194.68	12°40'30"	4°13'30"	8°27'	130.67	260.62	389.15	.0908
	400	6°40'	859.44	7.75	199.64	13°20'	4°26'40"	8°53'20"	134.09	267.37	399.04	.0931
	410	6°50'	838.48	8.35	204.59	14°00'30"	4°40'10"	9°20'20"	137.52	274.13	408.91	.0954
	420	7°00'	818.51	8.98	209.54	14°42'	4°54'	9°48'	140.96	280.89	418.77	.0978
5 Seconds	430	7°10'	799.48	9.63	214.48	15°24'30"	5°08'10"	10°16'20"	144.41	287.67	428.61	.1001
	440	7°20'	781.31	10.32	219.42	16°08'	5°22'40"	10°45'20"	147.88	294.46	438.44	.1024
	450	7°30'	763.94	11.04	224.35	16°52'30"	5°37'30"	11°15'	151.36	301.26	448.26	.1048
	460	7°40'	747.34	11.79	229.27	17°38'	5°52'40"	11°45'20"	154.85	308.07	458.05	.1071
	470	7°50'	731.44	12.58	234.19	18°24'30"	6°08'10"	12°16'20"	158.35	314.89	467.83	.1094
	480	8°00'	716.20	13.40	239.10	19°12'	6°24'	12°48'	161.88	321.74	477.59	.1117
	490	8°10'	701.58	14.26	244.00	20°00'30"	6°40'10"	13°20'20"	165.42	328.60	487.33	.1141
	500	8°20'	687.55	15.15	248.90	20°50'	6°56'40"	13°53'20"	168.97	335.48	497.05	.1164
	510	8°30'	674.07	16.07	253.78	21°40'30"	7°13'30"	14°27'	172.55	342.37	506.74	.1187
Maximum for 0 to 60 M.P.H. speeds	520	8°40'	661.11	17.04	258.66	22°32'	7°30'40"	15°01'20"	176.15	349.28	516.41	.1221
6 Seconds	530	8°50'	648.63	18.04	263.52	23°24'30"	7°48'10"	15°36'20"	179.77	356.21	526.05	.1234
	540	9°00'	636.62	19.08	268.38	24°18'	8°06'	16°12'	183.41	363.17	535.67	.1257

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

TRANSITION SPIRAL TABLE
49 M.P.H. SAFE SPEED

DRAWN BY	LESLIE McDONALD	DRAWING NO.
TRACED BY		A-45
CHECKED BY		
APPROVED FOR USE IN PLAN	E. L. Miller	

MISCELLANEOUS INFORMATION Beginning at Main or Initial Tangent	LENGTH ON SPIRAL IN FEET $100L_s$	D DEGREE OF CURVATURE aL_s	R RADIUS IN FEET $5729.58 \div D$	"O" OFFSET IN FEET $0.727aL_s^2$	t IN FEET $50L_s - .000127a^2L_s^5$	Δ_s SPIRAL DEVIATION $\frac{1}{2}aL_s^2$	θ DEFLECTION $\frac{1}{3}\Delta_s$	℄ DEFLECTION $\frac{2}{3}\Delta_s$	Y IN FEET $\frac{C \sin\theta}{\sin\Delta_s}$	U IN FEET $\frac{C \sin\text{℄}}{\sin\Delta_s}$	C IN FEET $100L_s - .0034a^2L_s^3$	SUPER-ELEVATION SLOPE FT. PER FT
Time @ 0 M.P.H.	0	0°00'	INFINITY		0.00	0°00'00"	0°00'00"	0°00'00"	0.00	0.00	0.00	0.0000
	10	0°15'	22,918.32		5.00	0°00'45"	0°00'15"	0°00'30"	3.33	6.67	10.00	.0024
	20	0°30'	11,459.16		10.00	0°03'	0°01'	0°02'	6.67	13.33	20.00	.0048
	30	0°45'	7,639.44		15.00	0°06'45"	0°02'15"	0°04'30"	10.00	20.00	30.00	.0073
	40	1°00'	5,729.58	.01	20.00	0°12'	0°04'	0°08'	13.33	26.67	40.00	.0097
	50	1°15'	4,583.66	.02	25.00	0°18'45"	0°06'15"	0°12'30"	16.67	33.33	50.00	.0121
	60	1°30'	3,819.72	.04	30.00	0°27'	0°09'	0°18'	20.00	40.00	60.00	.0145
Trans. Spiral Unnecessary	70	1°45'	3,274.05	.06	35.00	0°36'45"	0°12'15"	0°24'30"	23.33	46.67	70.00	.0169
1 Second	80	2°00'	2,864.79	.09	40.00	0°48'	0°16'	0°32'	26.67	53.33	80.00	.0194
	90	2°15'	2,546.48	.13	45.00	1°00'45"	0°20'15"	0°40'30"	30.00	60.00	90.00	.0218
	100	2°30'	2,291.83	.18	50.00	1°15'	0°25'	0°50'	33.33	66.67	100.00	.0243
	110	2°45'	2,083.48	.24	55.00	1°30'45"	0°30'15"	1°00'30"	36.67	73.33	110.00	.0267
	120	3°00'	1,909.86	.31	60.00	1°48'	0°36'	1°12'	40.00	80.00	119.99	.0291
2 Seconds	130	3°15'	1,762.95	.40	65.00	2°06'45"	0°42'15"	1°24'30"	43.33	86.67	129.99	.0315
	140	3°30'	1,637.02	.50	70.00	2°27'	0°49'	1°38'	46.67	93.33	139.99	.0340
	150	3°45'	1,527.89	.61	74.99	2°48'45"	0°56'15"	1°52'30"	50.01	100.00	149.98	.0364
	160	4°00'	1,432.40	.74	79.99	3°12'	1°04'	2°08'	53.36	106.70	159.98	.0388
	170	4°15'	1,348.14	.89	84.98	3°36'45"	1°12'15"	2°24'30"	56.68	113.37	169.97	.0412
	180	4°30'	1,273.24	1.06	89.98	4°03'	1°21'	2°42'	60.03	120.03	179.96	.0436
	190	4°45'	1,206.23	1.25	94.98	4°30'45"	1°30'15"	3°00'30"	63.38	126.71	189.95	.0461
3 Seconds	200	5°00'	1,145.92	1.45	99.97	5°00'	1°40'	3°20'	66.70	133.36	199.93	.0485
	210	5°15'	1,091.35	1.68	104.97	5°30'45"	1°50'15"	3°40'30"	70.06	140.05	209.91	.0509
	220	5°30'	1,041.74	1.93	109.96	6°03'	2°01'	4°02'	73.41	146.75	219.89	.0533
	230	5°45'	996.45	2.20	114.95	6°36'45"	2°12'15"	4°24'30"	76.77	153.43	229.86	.0557
	240	6°00'	954.93	2.51	119.94	7°12'	2°24'	4°48'	80.14	160.13	239.83	.0582
	250	6°15'	916.73	2.84	124.92	7°48'45"	2°36'15"	5°12'30"	83.49	166.81	249.79	.0606
	260	6°30'	881.47	3.19	129.91	8°27'	2°49'	5°38'	86.86	173.51	259.75	.0630
	270	6°45'	848.83	3.57	134.89	9°06'45"	3°02'15"	6°04'30"	90.24	180.22	269.70	.0655
4 Seconds	280	7°00'	818.51	3.99	139.86	9°48'	3°16'	6°32'	93.61	186.92	279.63	.0679
	290	7°15'	790.29	4.43	144.84	10°30'45"	3°30'15"	7°00'30"	97.01	193.65	289.56	.0703
	300	7°30'	763.94	4.91	149.81	11°15'	3°45'	7°30'	100.39	200.37	299.48	.0727
	310	7°45'	739.30	5.41	154.77	12°00'45"	4°00'15"	8°00'30"	103.81	207.10	309.39	.0752
	320	8°00'	716.20	5.96	159.73	12°48'	4°16'	8°32'	107.22	213.84	319.29	.0776
	330	8°15'	694.37	6.53	164.69	13°36'45"	4°32'15"	9°04'30"	110.65	220.60	329.17	.0800
	340	8°30'	674.07	7.14	169.64	14°27'	4°49'	9°38'	114.08	227.35	339.03	.0824
5 Seconds	350	8°45'	654.18	7.79	174.58	15°18'45"	5°06'15"	10°12'30"	117.53	234.13	348.88	.0848
	360	9°00'	636.62	8.48	179.52	16°12'	5°24'	10°48'	121.00	240.93	358.72	.0873
	370	9°15'	619.41	9.21	184.45	17°06'45"	5°42'15"	11°24'30"	124.48	247.76	368.53	.0897
	380	9°30'	603.11	9.97	189.37	18°03'	6°01'	12°02'	127.98	254.55	378.32	.0921
	390	9°45'	587.65	10.78	194.28	19°00'45"	6°20'15"	12°40'30"	131.49	261.39	388.08	.0945
	400	10°00'	572.96	11.63	199.19	20°00'	6°40'	13°20'	135.04	268.26	397.84	.0970
	410	10°15'	558.98	12.53	204.08	21°00'45"	7°00'15"	14°00'30"	138.60	275.12	407.54	.0994
6 Seconds	420	10°30'	545.67	13.47	208.96	22°03'	7°21'	14°42'	142.17	282.01	417.22	.1018
	430	10°45'	532.98	14.45	213.83	23°06'45"	7°42'15"	15°24'30"	145.79	288.95	426.88	.1042
	440	11°00'	520.87	15.48	218.69	24°12'	8°04'	16°08'	149.43	295.89	436.50	.1067
	450	11°15'	509.29	16.56	223.54	25°18'45"	8°26'15"	16°52'30"	153.00	302.88	446.09	.1091
	460	11°30'	498.22	17.69	228.37	26°27'	8°49'	17°38'	156.78	309.86	455.62	.1115
	470	11°45'	487.62	18.87	233.18	27°36'45"	9°12'15"	18°24'30"	160.52	316.91	465.13	.1139
	480	12°00'	477.47	20.10	237.98	28°48'	9°36'	19°12'	164.29	323.99	474.59	.1164
	490	12°15'	467.72	21.38	242.76	30°00'45"	10°00'15"	20°00'30"	168.10	331.08	484.00	.1188
7 Seconds	500	12°30'	458.37	22.72	247.52	31°15'	10°25'	20°50'	171.95	338.23	493.36	.1212
	510	12°45'	449.38	24.11	252.26	32°30'45"	10°50'15"	21°40'30"	175.85	345.42	502.67	.1236
Maximum for 0 to 50 M.P.H. Speeds	520	13°00'	440.74	25.56	256.98	33°48'	11°16'	22°32'	179.79	352.66	511.92	.1261

TABLE - F

TRANSITION SPIRAL TABLE FOR HIGHWAY CURVES

50 MILES PER HOUR CRITICAL SPEED = 73.30 FEET PER SEC.
41 MILES PER HOUR SAFE SPEED.
29 MILES PER HOUR FULL COMPENSATION SPEED.
AVERAGE STOPPING DISTANCE INCLUDING REACTION 221 FEET EXCEPT ON ICE OR SLICK SURFACE.
$a = 2\frac{1}{2}$ RATE INCREASE IN DEGREES OF CURVATURE PER 100 FEET ALONG SPIRAL.

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

TRANSITION SPIRAL TABLE
41 M. P. H. SAFE SPEED

COMPUTED BY	LESLIE McCORMICK '37	DRAWING NO.
CHECKED BY	H. S. [illegible]	A-46
DELEGRED BY	G. E. [illegible]	
APPROVED FOR PLANS	[illegible]	

TABLE-G

TRANSITION SPIRAL TABLE FOR HIGHWAY CURVES

45 MILES PER HOUR CRITICAL SPEED = 65.97 FEET PER SEC.
37 MILES PER HOUR SAFE SPEED.
26 MILES PER HOUR FULL COMPENSATION SPEED.
AVERAGE STOPPING DISTANCE INCLUDING REACTION 185 FEET EXCEPT ON ICE OR SLICK SURFACE.
$a = 3\frac{1}{3}$ RATE INCREASE IN DEGREES OF CURVATURE PER 100 FEET ALONG SPIRAL.

MISCELLANEOUS INFORMATION Beginning at Main or Initial Tangent	LENGTH ON SPIRAL IN FEET $100L_s$	D DEGREE OF CURVATURE aL_s	R RADIUS IN FEET $5729.58 \div D$	"O" OFFSET IN FEET $.0727\,aL_s^3$	t IN FEET $50L_s - .000127\,a^2L_s^5$	Δ_s SPIRAL DEVIATION $\frac{1}{2}aL_s^2$	θ DEFLECTION $\frac{1}{3}\Delta_s$	ϕ DEFLECTION $\frac{2}{3}\Delta_s$	Y IN FEET $\frac{C\sin\theta}{\sin\Delta_s}$	U IN FEET $\frac{C\sin\phi}{\sin\Delta_s}$	C IN FEET $100L_s - .00034\,a^2L_s^5$	SUPER-ELEVATION SLOPE FT. PER FT.
Time @ 45 M.P.H.	0	0°00'	INFINITY		0.00	0°00'	0°00'00"	0°00'00"	0.00	0.00	0.00	0.0000
	10	0°20'	17,188.74		5.00	0°01'	0°00'20"	0°00'40"	3.33	6.67	10.00	.0026
	20	0°40'	8,594.37		10.00	0°04'	0°01'20"	0°02'40"	6.67	13.33	20.00	.0052
	30	1°00'	5,729.58	.01	15.00	0°09'	0°03'	0°06'	10.00	20.00	30.00	.0078
	40	1°20'	4,297.19	.02	20.00	0°16'	0°05'20"	0°10'40"	13.33	26.67	40.00	.0104
	50	1°40'	3,437.75	.03	25.00	0°25'	0°08'20"	0°16'40"	16.67	33.33	50.00	.0131
1 Second	60	2°00'	2,864.79	.05	30.00	0°36'	0°12'	0°24'	20.00	40.00	60.00	.0157
	70	2°20'	2,455.53	.08	35.00	0°49'	0°16'20"	0°32'40"	23.33	46.67	70.00	.0183
	80	2°40'	2,148.59	.12	40.00	1°04'	0°21'20"	0°42'40"	26.67	53.33	80.00	.0209
	90	3°00'	1,909.86	.18	45.00	1°21'	0°27'	0°54'	30.00	60.00	90.00	.0235
	100	3°20'	1,718.87	.24	50.00	1°40'	0°33'20"	1°06'40"	33.33	66.67	100.00	.0262
	110	3°40'	1,562.61	.32	55.00	2°01'	0°40'20"	1°20'40"	36.67	73.33	109.99	.0288
	120	4°00'	1,432.40	.42	60.00	2°24'	0°48'	1°36'	40.00	80.00	119.99	.0314
2 Seconds	130	4°20'	1,322.21	.53	64.99	2°49'	0°56'20"	1°52'40"	43.35	86.67	129.99	.0340
	140	4°40'	1,227.77	.67	69.99	3°16'	1°05'20"	2°10'40"	46.69	93.36	139.98	.0366
	150	5°00'	1,145.92	.82	74.99	3°45'	1°15'	2°30'	50.01	100.03	149.97	.0393
	160	5°20'	1,074.30	.99	79.99	4°16'	1°25'20"	2°50'40"	53.36	106.69	159.96	.0419
	170	5°40'	1,011.10	1.19	84.98	4°49'	1°36'20"	3°12'40"	56.70	113.37	169.95	.0445
	180	6°00'	954.93	1.41	89.98	5°24'	1°48'	3°36'	60.05	120.05	179.93	.0471
3 Seconds	190	6°20'	904.67	1.66	94.96	6°01'	2°00'20"	4°00'40"	63.41	126.74	189.91	.0497
	200	6°40'	859.44	1.94	99.95	6°40'	2°13'20"	4°26'40"	66.76	133.43	199.88	.0523
	210	7°00'	818.51	2.24	104.94	7°21'	2°27'	4°54'	70.12	140.12	209.85	.0549
	220	7°20'	781.31	2.58	109.93	8°04'	2°41'20"	5°22'40"	73.49	146.81	219.81	.0576
	230	7°40'	747.34	2.95	114.91	8°49'	2°56'20"	5°52'40"	76.85	153.51	229.76	.0602
	240	8°00'	716.20	3.35	119.89	9°36'	3°12'	6°24'	80.23	160.22	239.70	.0628
	250	8°20'	687.55	3.78	124.86	10°25'	3°28'20"	6°56'40"	83.62	166.91	249.63	.0654
4 Seconds	260	8°40'	661.11	4.25	129.83	11°16'	3°45'20"	7°30'40"	87.01	173.65	259.55	.0680
	270	9°00'	636.62	4.76	134.80	12°09'	4°03'	8°06'	90.43	180.39	269.46	.0707
	280	9°20'	613.88	5.31	139.76	13°04'	4°21'20"	8°42'40"	93.84	187.14	279.35	.0733
	290	9°40'	592.72	5.91	144.71	14°01'	4°40'20"	9°20'40"	97.27	193.89	289.23	.0759
	300	10°00'	572.96	6.54	149.66	15°00'	5°00'	10°00'	100.71	200.66	299.08	.0785
	310	10°20'	554.48	7.21	154.60	16°01'	5°20'20"	10°40'40"	104.17	207.44	308.92	.0811
	320	10°40'	537.15	7.94	159.53	17°04'	5°41'20"	11°22'40"	107.66	214.25	318.73	.0838
5 Seconds	330	11°00'	520.87	8.70	164.45	18°09'	6°03'	12°06'	111.16	221.07	328.52	.0864
	340	11°20'	505.55	9.52	169.36	19°16'	6°25'20"	12°50'40"	114.67	227.91	338.28	.0890
	350	11°40'	491.11	10.39	174.26	20°25'	6°48'20"	13°36'40"	118.22	234.77	348.02	.0916
	360	12°00'	477.47	11.31	179.15	21°36'	7°12'	14°24'	121.78	241.66	357.72	.0942
	370	12°20'	464.56	12.27	184.02	22°49'	7°36'20"	15°12'40"	125.39	248.57	367.38	.0968
	380	12°40'	452.34	13.30	188.89	24°04'	8°01'20"	16°02'40"	129.02	255.52	377.01	.0995
6 Seconds	390	13°00'	440.74	14.37	193.73	25°21'	8°27'	16°54'	132.69	262.48	386.59	.1021
	400	13°20'	429.72	15.51	198.57	26°40'	8°53'20"	17°46'40"	136.39	269.51	396.16	.1047
	410	13°40'	419.24	16.70	203.37	28°01'	9°20'20"	18°40'40"	140.13	276.54	405.62	.1073
	420	14°00'	409.20	17.95	208.16	29°24'	9°48'	19°36'	143.91	283.63	415.06	.1100
	430	14°20'	399.74	19.27	212.93	30°49'	10°16'20"	20°32'40"	147.50	290.76	424.45	.1126
	440	14°40'	390.65	20.64	217.68	32°16'	10°45'20"	21°30'40"	151.53	297.93	433.77	.1152
	450	15°00'	381.97	22.08	222.40	33°45'	11°15'	22°30'	155.57	305.16	443.03	.1178
	460	15°20'	373.67	23.59	227.09	35°16'	11°45'20"	23°30'40"	159.57	312.45	452.22	.1204
7 Seconds	470	15°40'	365.72	25.16	231.76	36°49'	12°16'20"	24°32'40"	163.64	319.80	461.34	.1231
	480	16°00'	358.10	26.80	236.40	38°24'	12°48'	25°36'	167.77	327.20	470.37	.1257

Time @ 45 M.P.H. — Trans. Spiral Unnecessary

Maximum for 0 to 45 M.P.H. Speeds

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

TRANSITION SPIRAL TABLE
37 M.P.H. SAFE SPEED

COMPILED BY	LESLIE McDONALD	DRAWING NO.
TRACED BY	N.S. 3-21-38	A-47
CHECKED BY	G.F. 3-21-38	
APPROVED FOR USE OF PLANS	[illegible]	

MISCELLANEOUS INFORMATION Beginning at Main or Initial Tangent	LENGTH ON SPIRAL IN FEET $100\,L_s$	D DEGREE OF CURVATURE aL_s	R RADIUS IN FEET $5729.58 \div D$	"O" OFFSET IN FEET $.0727\,aL_s^2$	t IN FEET $50\,L_s$ $.00127\,aL_s^2$	Δ_s SPIRAL DEVIATION $\frac{1}{2}\,a\,L_s^2$	θ DEFLECTION $\frac{1}{3}\,\Delta_s$	ϕ DEFLECTION $\frac{2}{3}\,\Delta_s$	r IN FEET $\frac{C \sin\theta}{\sin\Delta_s}$	U IN FEET $\frac{C \sin\phi}{\sin\Delta_s}$	C IN FEET $100\,L_s$ $.00034\,a^2L_s^3$	SUPER-ELEVATION SLOPE FT. PER FT.
Time @ 40 M.P.H.	0	0°00'	INFINITY		0.00	0°00'00"	0°00'00"	0°00'00"	0.00	0.00	0.00	0.0000
Trans. Spiral Unnecessary	10	0°30'	11,459.16		5.00	0°01'30"	0°00'30"	0°01'	3.33	6.67	10.00	.0031
	20	1°00'	5,729.58		10.00	0°06'	0°02'	0°04'	6.67	13.33	20.00	.0062
	30	1°30'	3,819.72	.01	15.00	0°13'30"	0°04'30"	0°09'	10.00	20.00	30.00	.0093
1 Second	40	2°00'	2,864.79	.02	20.00	0°24'	0°08'	0°16'	13.33	26.67	40.00	.0124
	50	2°30'	2,291.83	.05	25.00	0°37.30"	0°12'30"	0°25'	16.67	33.33	50.00	.0155
	60	3°00'	1,909.86	.08	30.00	0°54'	0°18'	0°36'	20.00	40.00	60.00	.0186
	70	3°30'	1,637.02	.12	35.00	1°13'30"	0°24'30"	0°49'	23.33	46.67	70.00	.0217
	80	4°00'	1,432.40	.19	40.00	1°36'	0°32'	1°04'	26.67	53.33	80.00	.0248
	90	4°30'	1,273.24	.26	45.00	2°01'30"	0°40'30"	1°21'	30.00	60.00	90.00	.0279
2 Seconds	100	5°00'	1,145.92	.36	50.00	2°30'	0°50'	1°40'	33.33	66.67	99.99	.0310
	110	5°30'	1,041.74	.48	54.99	3°01'30"	1°00'30"	2°01'	36.67	73.34	109.99	.0341
	120	6°00'	954.93	.63	59.99	3°36'	1°12'	2°24'	40.01	80.02	119.98	.0372
	130	6°30'	881.47	.80	64.99	4°13'30"	1°24'30"	2°49'	43.35	86.69	129.97	.0403
	140	7°00'	818.51	1.00	69.98	4°54'	1°38'	3°16'	46.70	93.36	139.96	.0434
	150	7°30'	763.94	1.23	74.98	5°37'30"	1°52'30"	3°45'	50.05	100.05	149.94	.0465
3 Seconds	160	8°00'	716.20	1.49	79.97	6°24'	2°08'	4°16'	53.41	106.73	159.91	.0496
	170	8°30'	674.07	1.79	84.95	7°13'30"	2°24'30"	4°49'	56.77	113.42	169.88	.0527
	180	9°00'	636.62	2.12	89.94	8°06'	2°42'	5°24'	60.13	120.12	179.84	.0558
	190	9°30'	603.11	2.49	94.92	9°01'30"	3°00'30"	6°01'	63.50	126.82	189.79	.0589
	200	10°00'	572.96	2.91	99.90	10°00'	3°20'	6°40'	66.87	133.52	199.73	.0620
	210	10°30'	545.67	3.37	104.87	11°01'30"	3°40'30"	7°21'	70.27	140.25	209.65	.0651
4 Seconds	220	11°00'	520.87	3.87	109.84	12°06'	4°02'	8°04'	73.68	146.98	219.56	.0682
	230	11°30'	498.22	4.42	114.80	13°13'30"	4°24'30"	8°49'	77.09	153.72	229.45	.0713
	240	12°00'	477.47	5.02	119.75	14°24'	4°48'	9°36'	80.53	160.49	239.32	.0744
	250	12°30'	458.37	5.68	124.69	15°37'30"	5°12'30"	10°25'	83.98	167.27	249.17	.0776
	260	13°00'	440.71	6.39	129.62	16°54'	5°38'	11°16'	87.45	174.07	258.99	.0807
	270	13°30'	424.41	7.15	134.54	18°13'30"	6°04'30"	12°09'	90.95	180.88	268.78	.0838
5 Seconds	280	14°00'	409.26	7.98	139.45	19°36'	6°32'	13°04'	94.48	187.72	278.54	.0869
	290	14°30'	395.14	8.87	144.35	21°01'30"	7°00'30"	14°01'	98.03	194.60	288.26	.0900
	300	15°00'	381.97	9.81	149.23	22°30'	7°30'	15°00'	101.62	201.50	297.93	.0931
	310	15°30'	369.65	10.83	154.09	24°01'30"	8°00'30"	16°01'	105.25	208.44	307.57	.0962
	320	16°00'	358.10	11.91	158.93	25°36'	8°30'	17°04'	108.91	215.41	317.15	.0993
	330	16°30'	347.25	13.06	163.76	27°13'30"	9°04'30"	18°09'	112.62	222.43	326.67	.1024
6 Seconds	340	17°00'	337.03	14.29	168.56	28°54'	9°38'	19°16'	116.39	229.51	336.14	.1055
	350	17°30'	327.40	15.59	173.33	30°37'30"	10°12'30"	20°25'	120.21	236.62	345.54	.1086
	360	18°00'	318.31	16.96	178.08	32°24'	10°48'	21°36'	124.09	243.79	354.86	.1117
Maximum for 0 to 40 M.P.H. Speeds	370	18°30'	309.71	18.41	182.80	34°13'30"	11°24'30"	22°49'	128.05	251.04	364.11	.1148
	380	19°00'	301.56	19.95	187.48	36°06'	12°02'	24°04'	132.08	258.35	373.27	.1179
	390	19°30'	293.82	21.56	193.14	38°01'30"	12°40'30"	25°21'	136.19	265.74	382.33	.1210
	400	20°00'	286.48	23.26	196.77	40°00'	13°20'	26°40'	140.42	273.26	391.37	.1241

TABLE-H

TRANSITION SPIRAL TABLE FOR HIGHWAY CURVES

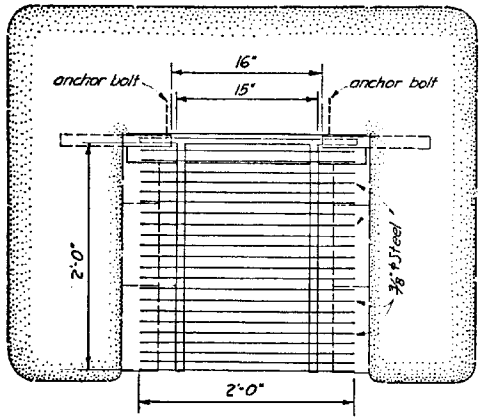
40 MILES PER HOUR CRITICAL SPEED = 58.64 FEET PER SEC.
33 MILES PER HOUR SAFE SPEED.
23 MILES PER HOUR FULL COMPENSATION SPEED.
AVERAGE STOPPING DISTANCE INCLUDING REACTION 151 FEET EXCEPT ON ICE OR SLICK SURFACE.
a = 5 RATE INCREASE IN DEGREES OF CURVATURE PER 100 FEET ALONG SPIRAL.

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

TRANSITION SPIRAL TABLE
33 M.P.H. SAFE SPEED

COMPILED BY	LESLIE McDOUGALL '37	DRAWING NO.
TRACED BY	K.S. 3-25-37	A-48
CHECKED BY	G.D. 3-25-37	
APPROVED		



GENERAL NOTES

Fireplaces to be set on leeward sides of tables in picnic areas.

Forms to be removed before concrete has cured, to permit stoning of rounded corners and removal of form marks.

Mortar for fire brick to be mixture of fire clay and 25% Portland Cement "buttered" on surface lightly with trowel to make a joint about 1/16" thick. After setting, the fireplace is to be fired strongly for several hours to further set the mortar.

Angle iron with 2 anchor bolts attached, to be tilted sufficiently to allow grill to remain upright when raised.

Pipe lengths to be set so that grill will lie flat when lowered.

Grill to be welded.

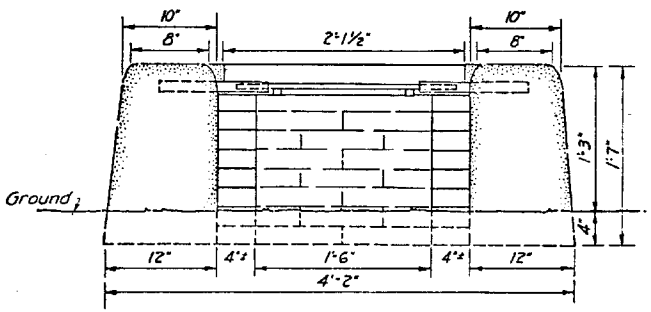
QUANTITIES

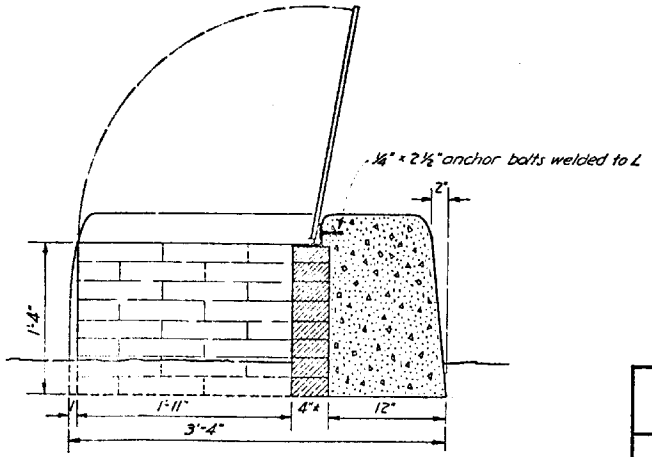
FIREPLACE

0.47 C.Y. "A" Concrete
48 Firebrick
0.6 C.Y. Str. Exc.

GRILL

1-3"×3"×1/4"×2'-1 1/2" L with anchor bolts
3-3/4"ϕ×24" Bars
23-3/8"ϕ×24" Bars
2-1" Pipes 12" long.





Scale 1"=1'-0"

TYPE "A"

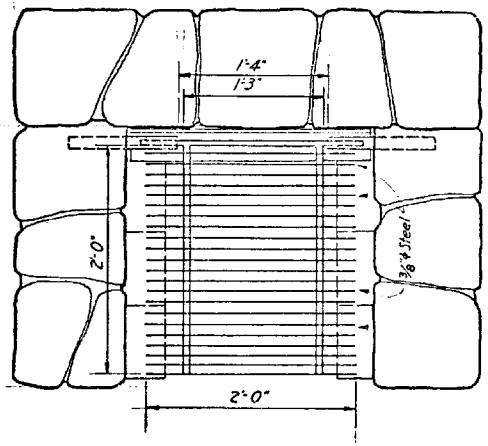
ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

TYPE A FIREPLACE

DRAWN	F.M.G.	Nov '39
TRACED	F.M.G.	Nov '39
CHECKED		
APPROVED CHIEF PLANS		

DRAWING NO. A-53



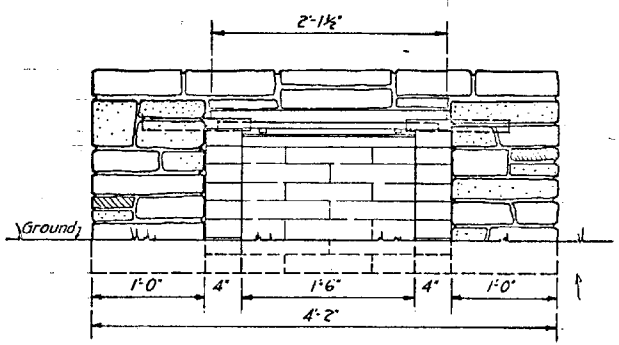
GENERAL NOTES

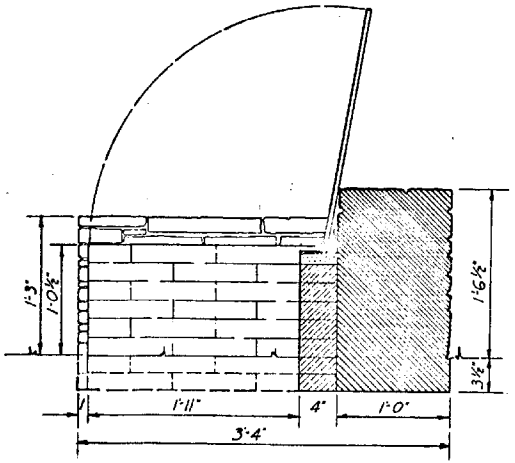
Fireplaces shall be set on leeward sides of tables in picnic areas.
Mortar for fire brick to be mixture of fire clay and 25% Portland Cement "buttered" on surface lightly with trowel to make a joint about 1/8" thick. After setting, the fireplace is to be fired strongly for several hours to further set the mortar.
All joints in stonework to be raked to 1/2" minimum depth
Use weathered stone where possible for exposed surfaces.
After painting, remove all excess mortar from faces of stonework.
Angle iron with 2 anchor bolts attached to be tilted sufficiently to allow grill to remain upright when raised.
Pipe lengths to be set so that grill will lie flat when lowered.
Grill to be welded.

QUANTITIES

FIREPLACE
0.54 C.Y. Cement Rubble Masonry
48 Firebrick
0.6 C.Y. Str. Exc.

GRILL
1-3" × 3" × 1/4" × 2'-1 1/2" L with anchor bolts.
3-3/4" ϕ × 2'-0" Bars
23-3/8" ϕ × 2'-0" Bars
2-1" Pipes 1'-0" long.





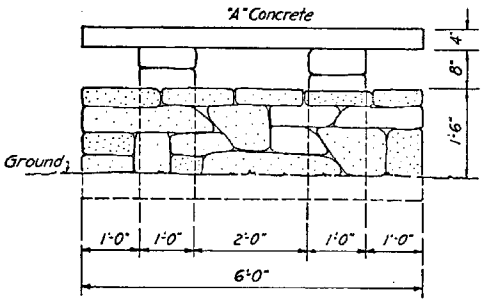
ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

TYPE B FIREPLACE

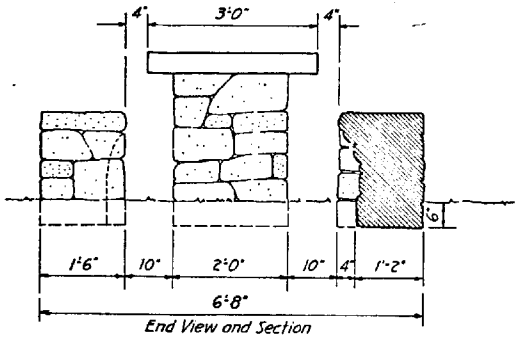
DRAWN	F.M.G. Nov '39	DRAWING NO.
TRACED	F.M.G. Nov '39	A-54
CHECKED		
APPROVED CHIEF PLANS		

TYPE "A"

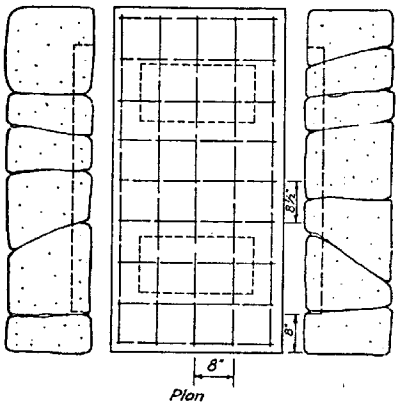


Side Elevation

Scale ½" = 1'-0"



End View and Section



Plan

GENERAL NOTES

All exposed edges of concrete must be smooth and rounded with a ½" radius.

Top slab to be precast and bedded on stone piers with 3:1 mix.

All joints in stonework to be raked to ½" minimum depth

Use weathered stone for all possible exposed masonry surfaces.

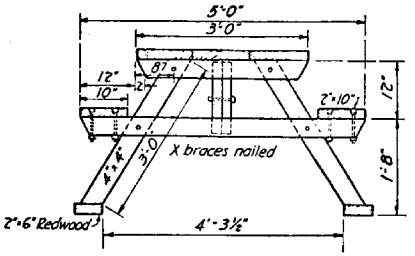
Fresh cut stone surfaces to be stained, old crankcase oil diluted with gasoline, and, when necessary, dusted to absorb excess oil.

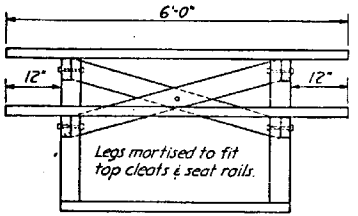
After pointing, remove all excess mortar from faces of stonework.

QUANTITIES

.22 C.Y. "A" Concrete.
1.57 C.Y. Cement Rubble Masonry.
5 Pcs. ⅜" ϕ Steel 5'-9½" long.
9 Pcs. ⅜" ϕ Steel 2'-9½" long.

TYPE "B"





GENERAL NOTES

All exposed edges of top and seats to be smooth and rounded.

Table to be well oiled with 2 coats of raw linseed, the first coat of which is to be applied hot, (1# burnt umber per gal.)

Boltheads on table top and seats to be countersunk flush with surface.

Woodwork to be stained after framing, prior to erection.

QUANTITIES

2 Pcs.	2" x 6" x 4'-0"	Rough Redwood						
1 "	4" x 4" x 12'-4"	S4S Pine or Douglas Fir.						#2 Clear
2 "	2" x 4" x 4'-0"	"	"	"	"	"	"	"
2 "	2" x 4" x 3'-0"	"	"	"	"	"	"	"
2 "	2" x 4" x 5'-0"	"	"	"	"	"	"	"
2 "	2" x 10" x 6'-0"	"	"				"	"
3 "	2" x 12" x 6'-0"	"	"				"	"
9 · ⅜" x 4½"	Carriage Bolts with nuts & washers							
20 · ⅜" x 6½"	"	"	"	"	"	"		

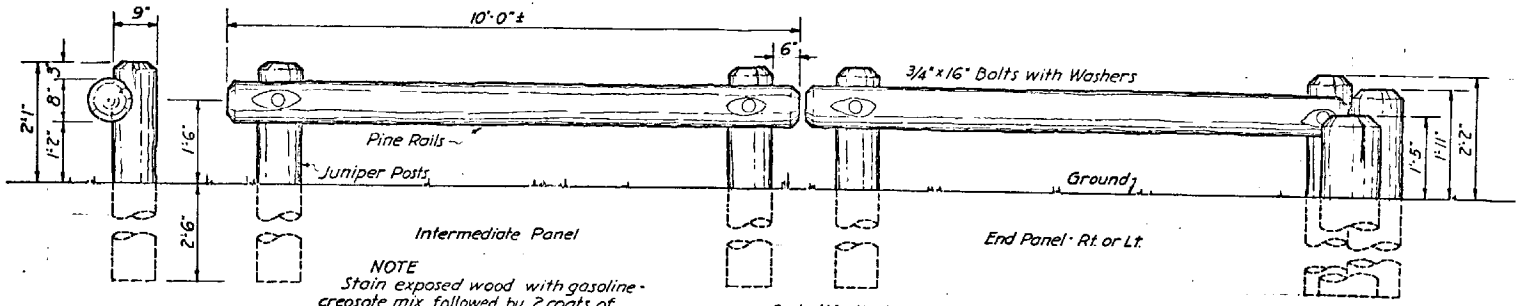
ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV. 3/1/41

PICNIC TABLES

DRAWN	F.M.G. Nov. '39	DRAWING NO.
TRACED	F.M.G. Nov. '39	A-55
CHECKED		
APPROVED CHIEF PLANS		

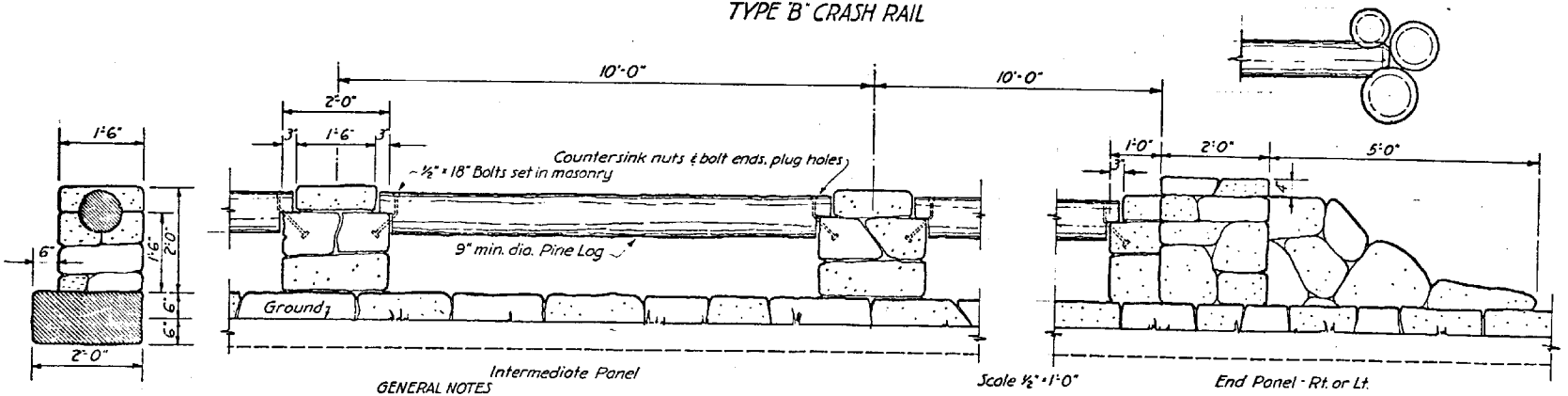
TYPE 'A' CRASH RAIL



NOTE
Stain exposed wood with gasoline-creosote mix, followed by 2 coats of raw linseed oil.
Creosote all wood in contact with ground.
Woodwork to be stained after framing and prior to erection.

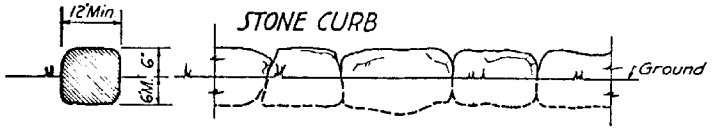
Scale ½" = 1'-0"

TYPE 'B' CRASH RAIL

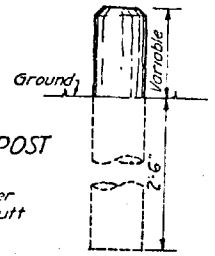


Scale ½" = 1'-0"

GENERAL NOTES
Stain exposed wood with gasoline-creosote mix, followed by 2 coats of raw linseed oil.
All joints in stonework to be raked to ½" minimum depth.
Use weathered stone where possible for exposed surfaces.
Fresh cut stone surfaces to be stained with old crankcase oil, diluted with gasoline, and, when necessary, dusted to absorb excess oil.
After pointing, remove all excess mortar from faces of stonework.
Woodwork to be stained after framing and prior to erection.



STONE CURB

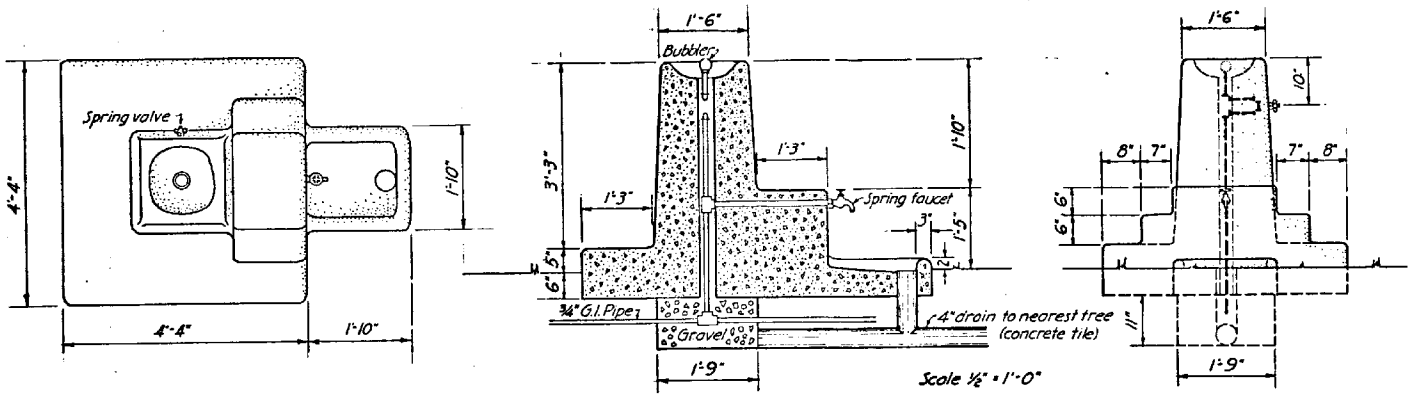


GUARD POST

NOTE
10" diameter
Creosote butt

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION		REV.
CRASH RAILS, STONE CURB GUARD POST		
DRAWN	F.M.G. Nov '39	DRAWING NO.
TRACED	F.M.G. Nov '39	A-56
CHECKED		
APPROVED CHIEF PLANS		

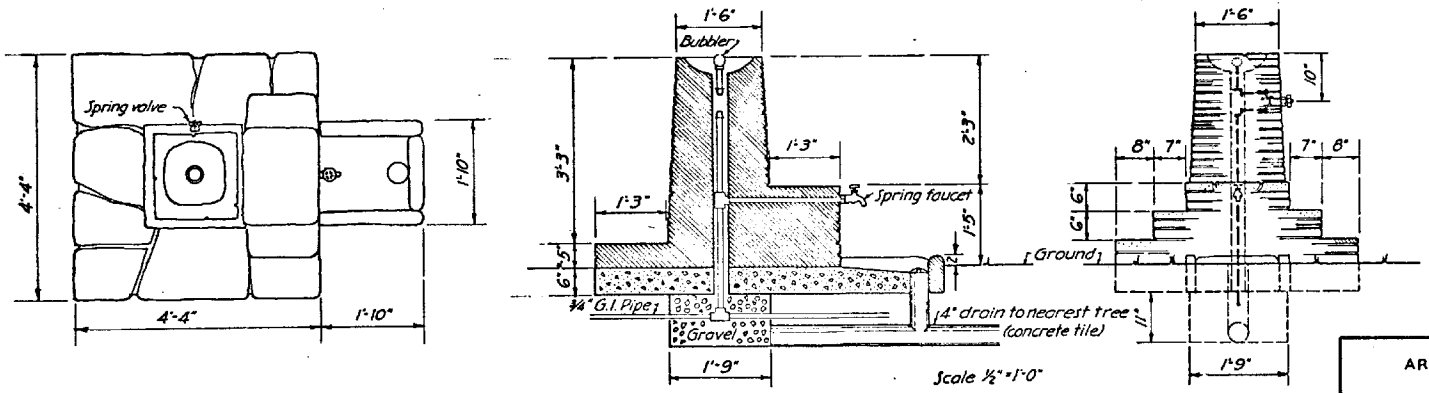
TYPE "A"



QUANTITIES
1.145 C.Y. "A" Concrete
1 Bubbler head
1 Spring faucet
1 Spring valve
7 lin. ft. ¾" G.I. Pipe

GENERAL NOTES
Concrete to be adobe colored through the use of burnt umber for pigment.
Forms to be removed before concrete has cured to allow stoning of rounded corners and removal of form marks.
All exposed edges of concrete must be smooth, and rounded with a 1" radius.

TYPE "B"



QUANTITIES
0.41 C.Y. "A" Concrete
0.73 C.Y. Cement Rubble Masonry
1 Bubbler head
1 Spring faucet
1 Spring valve
7 lin. ft. G.I. Pipe

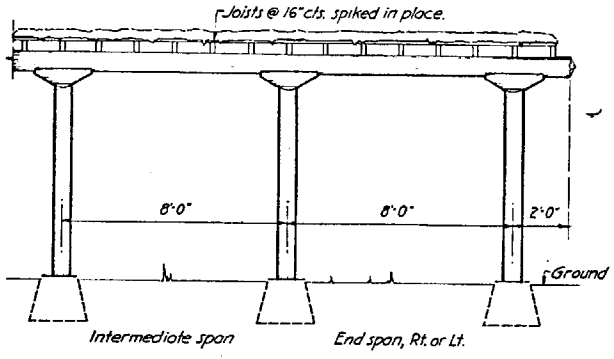
GENERAL NOTES
All joints in stonework to be raked to ½" minimum depth.
Use weathered stone where possible for exposed surfaces.
Fresh cut stone surfaces to be stained with old crankcase oil diluted with gasoline.
After pointing, remove all excess mortar from faces of stonework.
Plaster inside of drinking bowl with 3:1 Portland Cement mix.

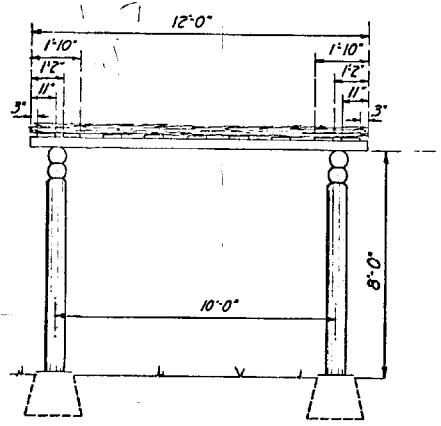
ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

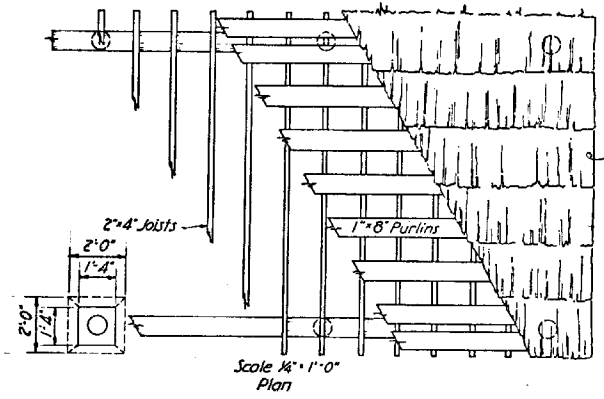
REV.

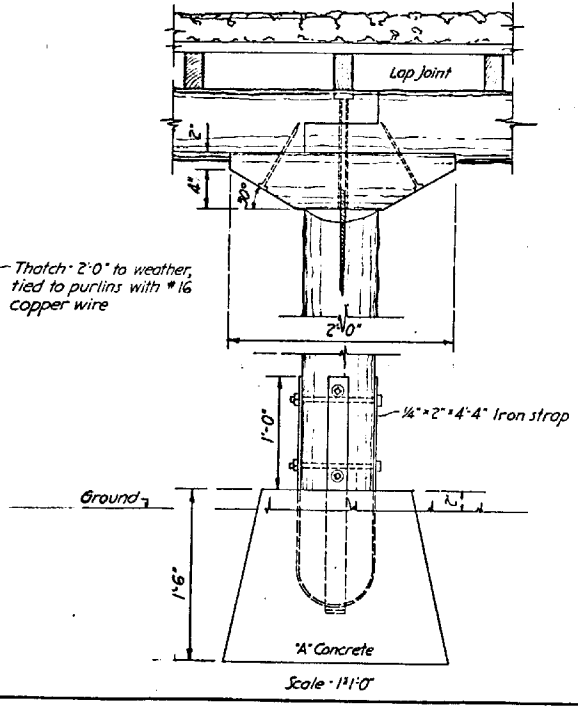
DRINKING FOUNTAINS

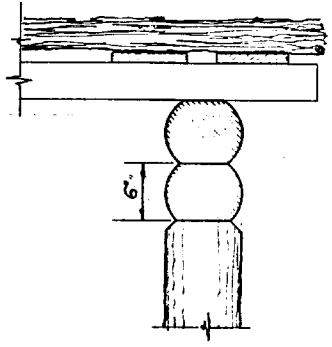
DRAWN	F.M.G. NOV '39	DRAWING NO.
TRACED	F.M.G. NOV '39	A-57
CHECKED		
APPROVED CHIEF PLANS		







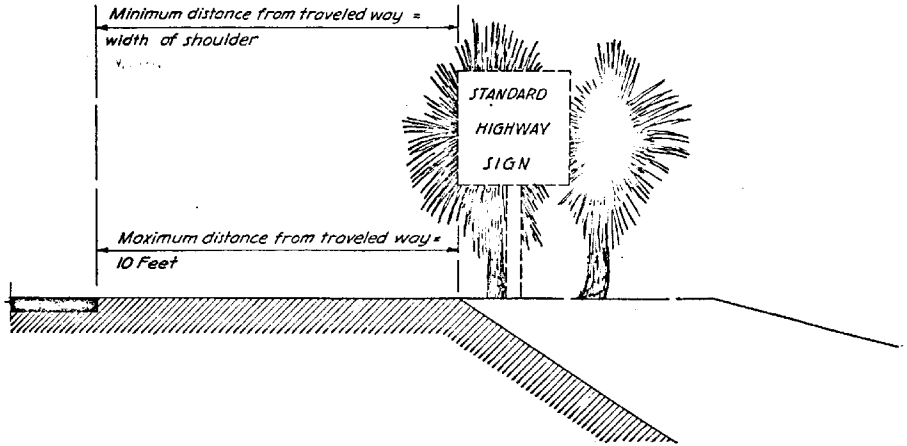


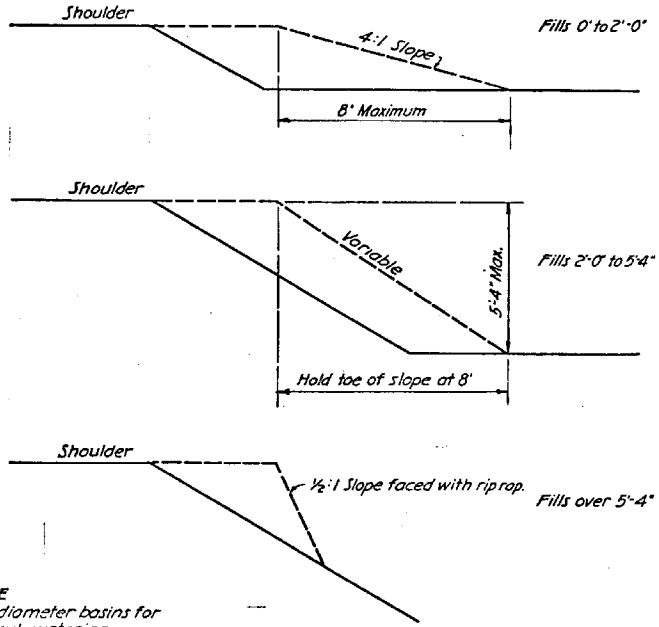


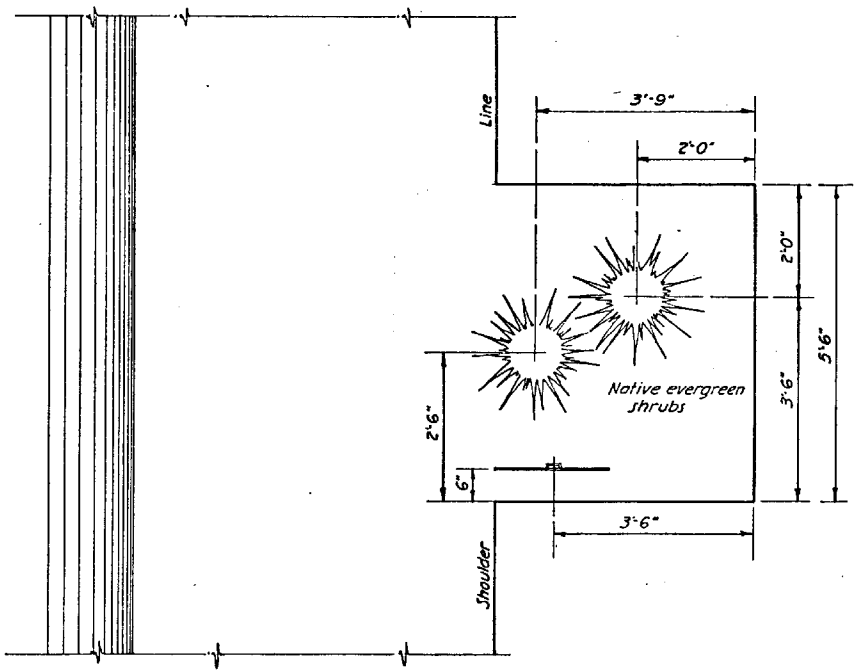
GENERAL NOTES

Thatch and lumber to be natural, rough finish.
Logs to have minimum diameter of 8" peeled
Logs to be given two coats raw linseed oil after framing and prior to erection.
Lintel & girder to be counterbored to pass lag screw freely.
Log butts to be creosoted for 1'-0" at base.

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION		REV.
RAMADA		
DRAWN	F.M.G. NOV. '39	DRAWING NO. A-58
TRACED	F.M.G. NOV. '39	
CHECKED		
APPROVED CHIEF PLANS		







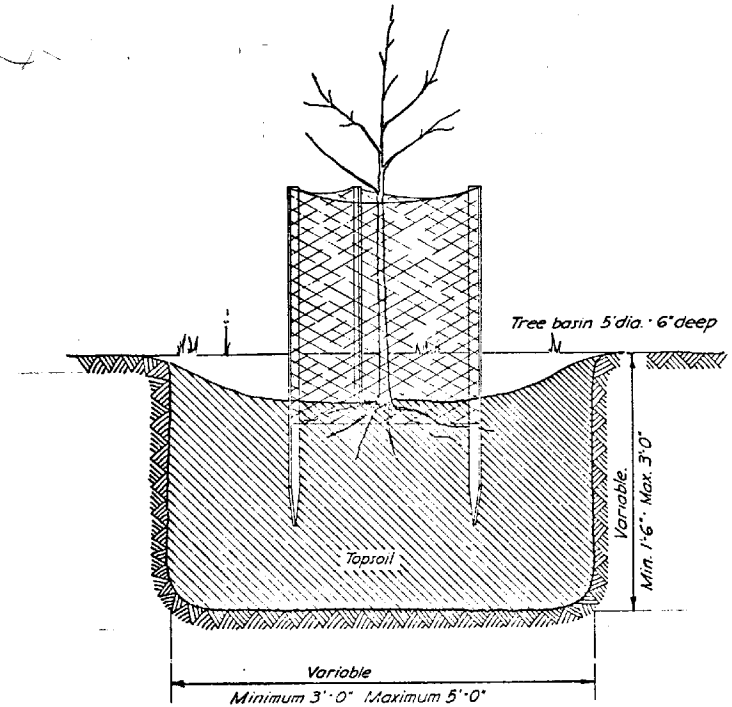
NOTE
Provide 2' diameter basins for temporary shrub watering.
Plant signs in cuts only where practible. - Where space is limited, shrub on right may be omitted.

ARIZONA HIGHWAY DEPARTMENT
PLANS DIVISION

REV.

SIGN PLANTING

DRAWN	F.M.G. NOV. '39	DRAWING NO.
TRACED	F.M.G. NOV. '39	A-59
CHECKED		
APPROVED CHIEF PLANS		



QUANTITIES
3 - 1" x 2" x 4'-0" Stakes
6 Lin. ft. 36" Chicken wire (2" mesh)

RABBIT GUARD

ARIZONA HIGHWAY DEPARTMENT PLANS DIVISION			REV.
RABBIT AND TREE GUARDS			
DRAWN	F.M.G. NOV. '39	DRAWING NO.	
TRACED	F.M.G. NOV. '39	A-60	
CHECKED			
APPROVED CHIEF PLANS			